JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXIII., No. 2626.] TUESDAY, SEPTEMBER 9, 1913. [65TH YEAR.

EDITORIAL NOTES.

Notes from Greenock Experience.

CONGRATULATION, rather than sympathy, should be extended to Mr. James Macleod, F.I.C., F.C.S., on the composition of his Presidential Address last week to the North British Association. In the opening passages, he appeared to rather bemoan the fact that pressing official duties at Greenock—additional duties demanded by extension, modification, and supersession of plant—had prevented him from giving consideration to some special subject as a feature for the address. But we see two reasons for pleasure in the fact that he was limited for subject-matter to recent works' experiences. In the first place, it shows that gas supply in Greenock is in a flourishing condition; and, in the second place, direct experiences as to difficulties, how overcome, and the choice of an engineer in the matter of new plant, always combine to make fascinating reading for other engineers, as it enables comparison with their own experiences in special directions. Mr. Macleod has had a diversified experience with more or less the whole of his plant since he has been at Greenock; and Greenock will have no cause to regret, at the end of the President's plans for setting the town's gas-works in order under the current conditions of supply, the expenditure that has been involved, while the President himself will occupy his position more lightheartedly in the sense of security that the busy time he has had in remodelling and extending his plant will give him. The "simple record" of what he has been doing really forms an extensive and peculiarly interesting survey. However, though there has been so much work to do since Mr. Macleod has been at Greenock, it must not be taken that this speaks of neglect on the part of predecessors. On the contrary, what they did was perfectly conformable with the day when they had the work in hand; and naturally economic reform is subject to several considerations, among them the question of propriety at any given time. A figure of no mean importance, in certifying both excellent engineering and administration in the past, is the £200 per million cubic feet of gas which represents, taking the position at June 30 last, the interest-bearing debt of the department. This is the lowest average in Scotland; and it is highly creditable to all concerned, past and present.

It would be impossible here to follow the President through all the parts of his address; but there are two or three features to which, by reference, additional prominence may be given. In connection with his sulphate of ammonia plant improvements, Mr. Macleod mentions how, in compliance with a local demand, he has entered upon the production of liquid ammonia; and that it is expected this will yield about 10 per cent. on the capital involved. This, of course, is one of those secondary forms of manufacture that there is little use adopting unless there is a local demand; but, at the same time, it is one of those extensions of activity in enlarging the business of the industry about which it is worth while getting on record actual details. We shall therefore hope that, after further working, Mr. Macleod will supply additional information as to experiences and financial results under his conditions, in order that they may be placed on record for the benefit of his professional *confrères*. But he has already found, as no doubt he expected to do, that the debits against, and credits on the side of, the process, are different from those involved in the case of sulphate of ammonia manufacture; and it will be interesting to see whether he does not also find on balance that sulphate of ammonia manufacture is a better paying process. In liquid ammonia production, more skill and intelligence are claimed; and additional lime, steam, oil, caustic soda, and water are required. But as a set-off against these extra expenses, no sulphuric acid whatever is needed; and there is no breaking, bagging, or filling, as with sulphate. Lead repairs, too—an item of no mean importance upon the sulphate side—are absent. Yet, again, the loopholes for the loss of ammonia are distinctly of a larger order than in the case of sulphate of ammonia manufacture. Therefore, we shall be pleased to see an actual balance-sheet on the limited line of working at Greenock.

A point in the part of the address dealing with distribution arrests attention—that is, the oxy-acetylene process of welding steel mains. When great care is exercised, there is no question that by this process one gets a rigid and tight joint, as has been proved at Nuneaton and experimentally elsewhere. But the making of a sound ordinary joint in a trench is not the easiest of work; and, when welding is the process adopted, the difficulty is accentuated, and extra precautions have to be taken. But often it is possible to deal with several lengths outside a trench, and then lower them; and here the operation is considerably simplified. Where, however, the length and width of roadway occupied is a matter of importance in association with the traffic, this cannot very well be done. And some road authorities are in these days getting more precise than ever as to the length and proportion of roadway that may be monopolized in mainlaying operations. But given a properly welded joint on a steel main, there is nothing to beat it, though at the same time criticisms have been raised as to the effect of contraction and expansion on continuously welded pipelines, as well as the question of the steel becoming more brittle at the point of the weld. Tests so far made have not supported the validity of the criticisms. The cost per joint quoted in the address appears to be somewhat high. For an 8-inch main, the cost Mr. Macleod has found was 4s. 1·03d. per joint. This, however, included the cutting-off of the faucet-rings of the pipes, and is not therefore fair as an example. In the case of 6-inch pipes, already prepared for welding, the cost per joint has not yet been taken out. We should have preferred this to the foregoing figure, which, even making allowance for the cutting-off of the faucet-ring, is higher than we expected. But, of course, a perfectly dependable joint is something for which it is worth paying rather more than joints that are less so. Apart from the information as to the cost per joint, it would be of interest if Mr. Macleod could give the total cost of laying per yard (including the jointing) ordinary pipes of the same dimensions, and under precisely the same conditions as to character of soil, depths, &c., with steel pipes ready for the weld joint, and steel pipes of the same size and length with an ordinary form of joint. This would enable a larger range of comparison of the expense incurred in pipe work of various descriptions.

Later in the address, it is seen that the President has decided to carry out an extension of his carbonizing plant on the Woodall-Duckham vertical retort system. We see in the future the Engineer of Greenock comparing notes with his neighbour of Helensburgh who has the Glover-West system in operation—true on a somewhat smaller scale. In dealing with the relative merits of vertical retorts and horizontal ones, it is often noticed that engineers do not extend the comparison beyond gas make per ton and quality; and, stopping there, dismiss vertical settings and working as partaking of the nature of a sentiment rather than producers of substantial advantages beyond their narrow line of consideration. The President has looked all round for the purpose of gathering together the advantages that come within sight in contrast with his present working; and he finds that, owing to higher make, there will be a considerable saving in cost of coal. Using at present compressed air for his retort-house machinery, there would be a reduction of the coke and breeze consumed under the boilers in producing the steam for the heavy steam-driven compressors. Steam-driven coke-conveyors would not be required, which again would mean a saving of fuel under the boilers. But conveyors of some kind—mechanical or human—will be needed to remove the coke from the verticals. He also looks for some

reduction of carbonizing fuel. With a lowering of the naphthalene content of the gas, it will not be necessary to treat the gas as now for the purpose of obviating stoppages; there is also the saving in labour in dealing with stoppages. He might likewise have taken credit for a certain amount of relief on the purifiers in respect of the lower sulphur content of the gas. Little or no water is required for coke quenching; and he calculates the cost of lighting the building will be less than in the case of his old house. This, of course, may be an advantage due to the defective character of the old house. Labour costs are also less. These items make a formidable list of comparative advantages, which rise and fall according to the system of working with which contrast is made, and which are all outside those two usual main and yet narrow points of comparison—gas quantity and quality. If Mr. Macleod glanced through the literature on the subject, he would find a few more claims that are not of negligible degree referring to the secondary products of vertical retort working.

We are glad to notice the President deprecating the advocacy of a reduction of the ratio of storage to output, on the ground that demand is nowadays better spread over hours of daylight and darkness than formerly. This is a point we have made before. What we foresee is, with the growth of the use of gas for heating, our erratic climatic temperatures causing such erratic demands that the present distance between maximum and normal demand at any given period will be greatly extended. We begin to hear afresh of day and even hour records of consumption; and so, combining such considerations with the new order of labour troubles outside the gas industry, we heartily agree with the President in saying that the responsibilities and anxieties of a gas engineer ought not to be increased through a lessened ratio of storage to demand. Let us keep a further consideration well to the forefront. It is this, that in our gas storage we have a protection of constancy of supply that our chief competitors cannot claim. Let the gas profession defend this superiority of position for all it is worth—and it is worth a great deal.

Economies in View and Net Cost.

It was with unfeigned pleasure that we heard that Dr. W. B. Davidson, of Birmingham, had been selected to deliver the second William Young Memorial Lecture before the North British Association at the annual meeting of the members. Good as are our officially detached men cultured in the science of gas making and secondary products utilization in sitting in critical judgment upon the work of others, there is much to be gained by bringing out from their shells, whenever opportunity offers, those gifted workers who investigate and scrutinize from the platform of practice itself. They are the ones who really do most in breaking fresh ground in progress. Dr. Davidson is no visionary. He is a man of ideas and ideals; and though in all things one may not agree with him entirely, the aim and end of his work is progress. The lecture delivered last week was a live one, pertinent to current thought and conditions, and withal stimulating. The need for deriving from the work of the gas industry still further economies grows more and more pronounced. There was a day when even expert opinion saw an industry almost destitute of further possibilities in this direction. That day has long since passed. Further economies and developments have come. And development begets development. Our lecturer groups for inspection additional possibilities in lines of technical operation that are prone in some respects to be neglected; and he also shows, what most competent managers of gas-works realize, that in the existing processes in the primary department of manufacture, there must be judicious procedure and selection according to markets and qualities of materials to secure the utmost advantage. The latter is an elementary principle in managerial conduct; and if this were the chief constituent of the lecture, then we should be disposed to leave it with very few words. But economical potentialities always serve as a topic to which the gas engineer is glad to have his attention directed, as it saves him from drifting along in contentment with present achievement, and making no effort to escape from the rut of fixed manufacturing routine.

Coal gas manufacture is already on an economic basis where modern plant is in use and modern practice is followed. But what will the gas engineer who, with modern carbonizing, washing, and purifying plant, and on the past year's cost of coal and values of residuals, is delivering gas at the station governors at a working cost of 7d. per 1000 cubic feet (on the basis of calculation defined in the early part of the lecture), say to Dr. Davidson's economies in embryo that promote the hope of reducing the cost by nearly 50 per cent., and more if the cost of coal recedes to 10s.? In the words of the lecturer, "should the economies in "candle power, fuel, and purification be realized, the cost "of gas, ready for distribution, should be reduced to 4d. per "1000 cubic feet, with coal and residuals at prices already "assumed. If coal were 10s. per ton, the cost of gas would "be as low as 2d." In this condition of things, we see a remarkable future for the gas industry, with cities and towns free from smoke pollution, and therefore more sanitary. But there is a natural reserve in building hopes too high even on promising conditions as sketched on paper by the most penetrating and far-seeing; and rising uppermost is a desire to see the material proof.

It is in coal gas making itself that the economies the lecturer has in view are to be found. He discusses the auxiliaries of coal gas; and he cannot find any latent economies in Mond gas or water gas for town gas supply. Carburetted water gas, too, with oil as low as 2d. per gallon, is dearer than coal gas on the calorific basis. But we cannot afford to judge carburetted water gas on the cost basis alone; and we cannot dismiss it as an invaluable adjunct to coal gas manufacture. What, however, is to be the future of water gas in the gas industry's operations, it is at the present moment difficult to say. It is impossible to tell whether it will, if the cost of oil continues high, become merely a stand-by to pick up sudden demand, and to help in times of stress, or whether it will be merely used to break-down a high grade coal gas. It is a plant that cannot, owing to its helpful advantages, be altogether neglected; but, as part and parcel of the plant for ordinary gas manufacture, its position is jeopardized by the oil market conditions, and that to the detriment of the industry's coke market.

There is the position of carburetted water gas as an enricher. This is also prejudiced by the falling away of the requirement for luminous gas-flames. The subject of enrichment occupies a foremost part in the lecture—dealt with partly to prove that economy does not reside in that direction; and we hope the time will come when we shall hear no more about the necessity for enrichment. Dr. Davidson, however, has always had a tender spot in his heart for the interests of those who use flat-flame burners. In effect, he says if they have a preference for flat-flame burners, let them have them, and let them have the gas they need. In having to deal in these pages with the current trend of fixing the necessary standards of illumination for various purposes, in having to meet the criticism that is levelled against the inefficiency of flat-flame lighting, and in having to depreciate the comparisons that are made of this inefficiency with the greater efficiency of competitors, our hearts become somewhat hardened towards those who persist in old-fashioned illuminating habits. Dr. Davidson urges continuous fighting to the ultimate economy in gas manufacture; but he would protect those who still cling to uneconomical flat-flame lighting! In Birmingham, he says, 40 per cent. of the gas used for illuminating purposes is consumed through flat-flame burners, and 60 per cent. by incandescent burners. But what is the percentage of the use of gas in flat-flame burners to the total quantity of gas sold for all purposes? Even though 40 per cent. of the gas sold for lighting is used through flat-flame burners, this, of course, does not represent 40 per cent. of the illumination required. What it comes to is that from every 40 cubic feet out of every 100 cubic feet sold for lighting in Birmingham, an illuminating power of only 100 candles is obtained; while from the remaining 60 cubic feet an illuminating power of some 1200 candles is obtained. The maintenance of this condition Dr. Davidson would encourage. Thus it comes about that we have the factory inspectors complaining of the bad illumination of factories where flat-flame lighting is the vogue, and bringing the gas industry into disrepute. It is therefore not only the present so-called requirements of the consumer—part of which is the product of complacency and lethargy—with which we have to deal, but with the work that is proceeding behind the back of the industry in educating the users of flat-flame burners to higher standards of illumination by the aid of the competitors of the gas industry. We must not get so absorbed in our gas-manufacturing work that we neglect the trading influences set in motion and cultivated by those whose interests are not necessarily favourable to the industry.

Where, however, the question of enrichment has to be

considered to comply with illuminating power standards, the views of Dr. Davidson, and the principles laid down by him, will be worth bearing in mind. It is not always realized by gas managers that when (to adopt the lecturer's words) the enriching agent is considerably more expensive candle for candle than normal coal gas, the richer the enriching agent is, the cheaper will be the resulting mixture—provided, of course, there is no counterbalancing sacrifice in efficiency. It is only the excess in effective candle power over and above that of the coal gas that really counts. This is a fact that upon the merest consideration is obvious; but it is one the lessons of which are frequently ignored, whatever be the form of the enrichment—whether carburetted water gas, oil gas, cannel gas, or benzol. Speaking of water gas, there is introduced a very successful method of dealing with the hitherto troublesome carburetted water-gas tar emulsion, whereby this waste product is turned into a source of revenue; and this with low-cost plant, and low working charges. A saleable heavy tar is secured, and light oil vapours are recovered and added to the gas—a sufficiency being obtained to allow of naphthalene solvent being dispensed with. It has also been found possible to add 3 per cent. and more of air without loss in candle power. The reduction in purification wages thereby effected was found to be equal to ¾d. per ton of coal carbonized, besides securing the foregoing advantages.

Notwithstanding what has been said as to the tendency of the lecturer to defend the interests of the flat-flame user, we find him advocating the fixing of calorific value as the primary standard, with illuminating power as a subsidiary one, as providing an important economy in gas manufacture, in view of the fact that it dispenses with expensive enriching agents. We are all in agreement with Dr. Davidson as to the primary standard, but entirely in opposition to any spoke, subsidiary or otherwise, being put into the wheel of progress of the gas industry. If calorific value is the primary need, then let us work for it, and place our trust in it as the prime essential, in degree compatible with cost, of the gas industry. In the change from the one standard to the other, there is a source of economy in our manufacturing operations. But, following the lecturer, we cannot hope for any further great economy in carbonizing wages, in repairs to settings, in coke conveying, and in power. Nor can interest and depreciation be greatly affected without interfering with fuel efficiency. But in placing the finger upon fuel efficiency, there is a point for profitable consideration. It is somewhat amusing for one to see the light-mannered way in which fuel consumption is reckoned in these days; and high and low fuel costs, as the case may be, are arbitrarily allocated to carbonization. There is no item more susceptible to the charge of inexactitude in the process of coal carbonization, but the process of arbitrary estimate goes on without halt from generation to generation. We have frequently spoken of this in the columns of the "JOURNAL;" we have likewise on various occasions drawn attention to the question of the possible saving in fuel to be effected by the control of the primary air supplies of retort-settings. There is nothing new in the automatic control of the air supplies to furnaces in other industries; but it is a matter that has been neglected in our own. Dr. Davidson, however, now describes a simple, counterbalanced, pivoted flap-valve, which has been invented by Mr. Brooke, the Superintendent of the Nechells works at Birmingham. This is fixed in the primary air ports, and is adjusted to respond to slight variations in the draught, so that the volume of air drawn through the fire, and hence the amount of producer gas, is regulated, and kept practically constant, despite the varying conditions of the fuel bed. The system is being gradually introduced into the Birmingham works; and some extraordinarily good savings are shown in the lecture—not all ascribed to the use of the automatic regulator, but there is no question that credit for a substantial part may be taken by it. In industry events sometimes move fast, and opinions are thereby changed with alacrity. Dr. Davidson was not long since looking favourably to Mond producers (with ammonia recovery) for affording an economical means of heating coal-carbonizing plant; but even a simple device such as the one referred to, which gives a return that seems altogether disproportionate to its simplicity, causes a veering of opinion—at any rate, an uncertainty—as to whether the ultimate benefit rests upon the side of a revolution in practice, or of an improvement on the old system.

Fuel economy would be in many works an important addition to the economy that a calorific standard, in place of an illuminating power one, would promote. On the works there are the seats for several minor economies that, in the result, contribute to the making of substance; and some of these are pointed out in the lecture. But so far we feel that the case for the large reduction of the cost of gas at the station governor, as placed by Dr. Davidson before his North British audience, has not been fully made out; and we must rest for a time content in believing that the source of greatest economy and profit that the lecturer sees in the future is in the "new methods of removing impurities, which must be more or less bound up with the sale or the working-up of ammoniacal liquor, sulphur, cyanogen, and (one might almost say) tar," in which there is a very "wide field for discovery." Our thoughts wander back to the intimation that Dr. Davidson gave in his Institution paper of what he is doing in the matter of liquid purification at Birmingham; and his further reference shows that here he sees scope for development. Here, too, he found the opportunity for linking-up a future economy with the prescient work of William Young, whose gifts enabled him to trace so many of the fundamentals of then distant improving work. We shall not consider Dr. Davidson's lecture complete until we learn more as to the success of his work in liquid purification. Whether or not it is to form a good part in the economies of the future, we shall all pray for the day to hasten when, at last year's market prices for coal and residuals, gas can, in the larger and well-equipped works, pass the station governor at a production cost of 4d. per 1000 cubic feet, or, with coal at 10s. per ton, at a cost of 2d. But the chief lesson of the lecture, apart from any hard-and-fast determination of cost, is that there are further potential economies to be made in systematic working and improvements. It is for each responsible official to explore well at every side and in every corner of his working for these economies; and the final result may spell "Advantage" of larger aggregate form than is anticipated before the exploration commences.

Gas Sales Developments, and Depreciation Allowances.

THE papers read at the North British Association meeting last week were all more or less of a commercial character, and were devoted to various aspects of the development of gas sales. If one looks around in Scotland, there are found the opposite extremes of policy in connection with the means adopted for extending the gas business. Some administrations have gone to the full limits of the forward policy, and others lag behind in a most curious fashion, and do practically nothing, which is the less irksome of policies, but the surest way, having regard to current indications, of landing a concern in financial difficulties. But the most progressive gas concerns in Scotland, like those in other parts of the United Kingdom, are building up an experience in modern gas business from which everywhere there should emerge the highest standards of trading policy and the best-shaped ways that should be more productive of luxuriant result than ever before. Those upon whom has devolved the responsibility of inaugurating a department or a scheme for meeting the demands of the day in respect of developing the sales of gas, have found themselves confronted by many difficulties handed down from the old policy, and the old manual equipment; and we have not yet met with a single man who has undertaken the duty of pioneering the new order of things who has not found that the experience accruing from his own work, combined with that of other men in similar responsible positions, has not continually enabled him to break into some fresh improvement.

This has been the experience of Mr. R. Halkett, of Glasgow, as disclosed by his paper at the North British Association meeting on the sales and distribution department. He has his highly organized scheme; and he believes it to be good. Yet his paper shows where and how there is room for considerable improvement. The general lines on which such a department should be managed are fairly obvious; but, unless it is a well-disciplined and supervised department, even the most obvious lines of management and conduct are apt to be neglected. Mr. Halkett is strongly of opinion that the commercial departments of many gas undertakings might do more; and we are quite prepared to rank ourselves with him in making and urging this point. We will not follow him in his survey of the work and methods upon which a gas sales department

should be built. They are many and varied. But in the forefront of the requirements of such a department stand a well-trained and contented staff. Much has been heard as to the training and education of gas-fitters, and how to elevate the knowledge of those to current need who were brought up as fitters in the days and conditions of langsyne. But pre-eminent is the question of the responsible chief. In the discussion of the training of the staff, "re- "sponsible chiefs" have been apt to overlook the importance of the qualifications for their own office; and if we place our finger on one point that is superior to all others in the paper before us, it is the one that deals with the provision of responsible chiefs for gas sales departments. It does not follow because those who obtain the City and Guilds of London Institute certificates in "Gas Supply" may be counted by their hundreds, that there are hundreds who are to-day capable of taking the helm of the gas sales department of a large or even a moderate-sized undertaking. There are not; and Mr. Halkett claims, with force, that there should be a proper training of men to take the command—a training to include not only commercial work, but theoretical knowledge and practical work taking in the whole range of modern gas application and utilization.

In fine, the work of the sales department is so important to the stability of a gas concern, that Mr. Halkett goes to the length of saying (and here, too, he has our full support) that men who are to take supreme command in the future should be articled and trained in the work, precisely in the manner that the gas engineer is articled and trained for constructing gas-works and making and distributing gas. We agree with him. Supplanting the principles underlying gas engineering and manufacture would, in the case of the pupil to the qualified chiefs of gas sales departments, be the principles underlying gas application, utilization, combustion, temperatures, and so forth. The time spent by the gas-engineering pupil in the works' shops, and in mastering the practical work associated with the processes of gas manufacture, would, by the new order of pupil, be spent in the fittings and repairing shops of the distribution department, and in the show-rooms, in actual fitting work on the district, and in acquiring a knowledge from "A" to "Z" of the materials and construction of gas appliances, and of the object of their every detail. Management and commercial work would follow. Only thus shall we get men thoroughly qualified, and thoroughly conversant with the work of the sales department, who can take supreme command in organizing, managing, supervising, initiating, and leading, and men who will command respect. This one point, in our view, stands out prominently in the paper; and, commending it for further consideration, we hope to see its development. Men must be fitted for such responsible positions in the same systematic manner that the actual work of the sales department is conducted. But men fully trained and properly qualified for such positions must be recompensed in suitable manner.

Also having in view the development of gas sales, Mr. David Vass contributed a polemical little paper on the subject of the supply of free gas appliances to householders. This is a topic upon which *pros* and *cons* can be advanced *ad libitum*. The gas industry has to look to the future as well as to the present. "Sufficient for the day is the "prosperity thereof" may have a nice ring about it; but it is an inadequate view for assuring a continued expansion, and a position from which the industry cannot be disestablished. The policy of the free supply of gas apparatus is one that can only be entered upon with prudence and with safeguards, in consideration of the heavy capital expenditure involved. Certain gas undertakings have made quite a distinguished success in multiplying their connections by the free supply principle; and if they can show that, through the gas consumption promoted by the supply of such free apparatus, there is a profit to the undertaking, then they are wholly justified in what they are doing. At Perth, Mr. Vass assures us, the appliances loaned without rent do, in the aggregate consumption of each house, produce their due profit; otherwise an agreement would come into play under which the consumer is bound to pay a surcharge, at the rate of 1s. per 1000 cubic feet, for any quantity short of the guaranteed gas consumption. The scale is 1000 cubic feet for every 10s. of net cost of the apparatus fixed; and as the consumer has usually other appliances consuming gas, the experience is that the total consumption is generally in excess of the guarantee, and no surcharge has, therefore, to be made. This is a simple and a consumption-encouraging arrangement. But there are sure to be managers who will argue that it is unfair to those who only use gas for lighting, as in effect the consumers with the free apparatus get their gas, in view of the rent-free appliances, at a lower cost per 1000 cubic feet. We do not see where the unfairness comes in, as like opportunities and conveniences are offered to all lighting consumers; and the rent-free appliances may be looked upon as a discount for enlarged and daylight consumption. Moreover, Mr. Vass's system must also act as a deterrent to a change-over to another illuminating agency. There is the point, too, as to the inequality of use of the rent-free appliances bringing about an inequality in contribution towards the profits of a concern. But every system devised for promoting business that deviates from a flat-rate for a given quantity has disadvantages somewhere; and there is an easy way of levelling-down any inequality by allowing discounts at various stages of consumption in excess of the minimum. Of course, the ideal system for fairness is the lowest possible rental for appliances with a flat-rate for gas. But in some cases the rental is a greater obstacle to gas development than a penny or two more on the price of gas. Anyway, we really do believe that, where the ordinary price is at a fairly reasonable figure, free-supplied appliances will have more business-extension influence than will differential prices. Touching the expenditure upon such appliances, there is a point in the paper to which reference has yet to be made; and this point will be dealt with towards the conclusion of this article.

The other paper we have to notice was not entirely of a commercial nature. It was by Mr. J. B. Scott, of Cowdenbeath. We like it for the large amount of commonsense it contains on both of its two sides, which sides the author hinges together in a clever manner by means afforded by part of the terms of the scheme in respect of depreciation allowance for income-tax purposes, agreed upon between the Committee representing a number of large gas companies and the Inland Revenue Commissioners. The paper invites comment upon various details; but we will now only call attention to the point of chief importance. Generally speaking, Mr. Scott looks upon the scheme referred to as being decidedly more satisfactory than anything that can be obtained by procedure under the legislation governing the matter, largely subservient as the rates of allowances are to the whims and fancies of individual assessors. He draws up a figured example to show how a moderate-sized concern benefits by the agreed scheme, as compared with the scale of percentages which he has found assessors allow under the controlling Acts. It is refreshing to find some independent person speaking in such unqualified terms of praise of what the Committee did in the matter of this scheme. Though representing as they did the major part of the capital of statutory gas undertakings, they did not in the result satisfy everybody. This is not surprising, for they did not get all for which they themselves argued; but what they did obtain was the best possible by amicable discussion and arrangement with the Commissioners. Those who disagree with them have either to fall into line until such time as further revision can be realized, or fight their individual cases with the certainty that the terms of the scheme will be the ones to succeed eventually. Mr. Scott finds, when compared with his past actual experience, a considerable advantage in the agreed scheme.

There is one point, however, about it which, in connection with the development of the sale of gas, the author looks upon with much favour, and as rendering large assistance in these days, when the duty and the policy of gas undertakings are to extend as far as possible the consumption of gas among residents in the poorer class of property. Scotland, generally speaking, appears to be very much behind England in the development of the prepayment system. This is rather surprising, although—again speaking generally, and excluding certain progressive cities and burghs—Scotland has also been behind England in giving up the worship of high illuminating-power gas, and furnishing to their constituents a gas more useful for consumption through bunsen burners. Mr. Scott argues in favour of the adoption and pushing of the slot system. It seems strange to us down south that there should to-day be any need for such argument. But that there is, is quite apparent from the paper. The tendency in some places in Scotland has been to limit the provision of gas to those houses in which the landlord supplies the fittings, and ordinary meters are used. In such cases the cost to the gas

authority is, under the conditions described in the paper, about £2; whereas the full provision of a prepayment installation, including a griller, only costs £2 os. 6d. more. This being so, as the author points out, it is only fair to take this difference in cost—the capital difference between the ordinary and the prepayment meter consumer—as the charge against the prepayment system. Therefore repayment of this, with 5 per cent. interest, would mean, as near as possible, 6s. per house per annum; and this, on an average gas consumption of 10,000 cubic feet per annum, would only necessitate, on these figures (based on present costs), a charge beyond the ordinary of 7½d. per 1000 cubic feet. This does not make allowance for the increased attention and cost of collection involved; but Mr. Scott holds, and with reason, that, the prepayment consumption being in the nature of a cash sale, the consumer deserves something for paying ready cash. We make out, too, that the average charge would really be less than the 7½d., in view of the gradual reduction, through it, of the principal involved; and there is a further saving (equal to the interest) to be effected through the depreciation allowance scheme agreed upon with the Inland Revenue Commissioners. The agreement provides: "No depreciation shall be allowed in re- "spect of services and fittings; but in lieu thereof *all* "*expenditure shall be allowed as a trading expense as and when* "*incurred*." This is where slot installations and free fittings come in. Upon the money thus expended and allowed as a trading expense, there is a saving of 1s. 2d. in the pound, which is about equal to 6 per cent. on the initial outlay. This is a neat point; and we extract it, and give it emphasis, as being one of the chief features bearing upon the development of gas trading, which it is the object of the three North British papers to promote.

Gas and the Midland Disaster.

THE terrible circumstances of the disaster that took place early last Tuesday morning on the Midland Railway, not far from the scene of the equally shocking Hawes Junction accident of 1910, have filled with horror all who have read the details. There were sixteen deaths, and a number of travellers were injured; and, through the fire that occurred, the remains of some of those who prematurely met their deaths are unrecognizable. The accident itself is one that can only be attributed to the failure of human agency. We should not have to refer to the subject at all in these columns, and should have been thankful to have been relieved of the task, were it not that the collision has again raised the question as to the participation of gas in the firing of railway coaches in accidents—a question originally set afloat by parties interested in opposing the gas industry and by official reports, the impartiality of which is unquestioned, but the conclusiveness of which is questioned, because in equally competent opinion the evidence on no single occasion justifies the suspicion cast on gas. In connection with this Aisgill disaster, the newspapers of the country have prematurely assumed that the compressed gas carried by two of the three coaches that were destroyed—one was electrically lighted, and was completely gutted—caused the fire, or contributed to its fierceness. They did the same thing in the case of the Hawes Junction disaster; and they have now reproduced portions of the report that Major Pringle then made on the subject. In this document, the Inspector admitted that, though gas had been used for the purpose of lighting railway trains for a great number of years, the Hawes Junction accident was the first one in which it had been found that gas had contributed to the fire following the collision and the wrecking of the coaches. It was also conceded by the Inspector that gas had many advantages, including economy, for the lighting of the vehicles; but he suggested that its use should be better safeguarded, and for long-distance and express trains should be discontinued. At the time, we combated on the evidence itself the fire-contributing conclusion of Major Pringle. On the present occasion, there is again *primâ facie* evidence that gas could not have contributed to the fire, but that—especially in view of the fact that it was stored in the cylinders under high pressure—it must have been dispersed before the fire actually broke out.

The official report of the Railway Company states that the fire was confined to the three wrecked coaches of the train that was standing still for want of steam, and was started by the live fire scattered by the engine of the express train which collided with it. The statements of eye witnesses confirm the official report; and the fact that an appreciable time elapsed before flames actually broke out after the coaches had been completely smashed, with the engine embedded in the wreckage, indicates that the gas must have found free escape. At any rate, there is present justification for the conclusion. If it is shown that the gas cylinders were seriously fractured, then the theory that the oil gas contributed to the conflagration must be at once dispelled; as had the gas not been at once dissipated, or inflamed harmlessly in a sheet in the air, it must have immediately ignited, and shot upwards long jets of flame that would have illuminated the whole surroundings. This it did not do.

What is the nature of the evidence? The wreckage of the dry wood coaches was complete. The first coach of the second train mounted the top of the tender of its engine; the engine forced itself into the frame of the last coach of the first train, and this coach was partially telescoped into the one preceding it. One lady passenger who was saved stated to a press representative that, on reaching the back of the train after the collision, "we could see a pile of smashed wood. "The big engine seemed to be in the midst of it; and "steam, smoke, and sparks were streaming from it. *Then* "flames appeared, and quickly spread." A Mr. Brander says: "The darkness was our greatest trouble. *For a time* "*we had no light; and then at last came* the terrible light "we did not want—the flames from the burning compart- "ments." Miss Clark, who with a Mr. Thomas jumped out of the stranded train before the collision occurred, stated: "The lights were gone in the wrecked coaches, and "everything was in a state of confusion. Every minute we "expected an explosion; but it did not come. We ran "along the line to the wreckage. The lights in most of "the coaches of our train were all right." There we have the simple tale from independent witnesses. The lights in the wrecked carriages—two gas lighted and one electrically lighted—were out; and there was quite an appreciable time before there were flames from the wreckage. Had the gas been ignited by the engine, the flaming of the wreckage would surely have been instantaneous. But it was not. The wrecking engine, however, stood in the midst of, and threw live fuel among, the splintered dry wood; and yet an appreciable time elapsed before the woodwork burst into flames. Still another report says that "the colliding engine "presented the most extraordinary spectacle; the whole body "having obviously been in the very thickest of the fire, and "charred almost beyond recognition."

What theoretically we should say would happen to the gas cylinders in such a terrible collision appears to be supported by the evidence given by Guard Donnelly, at the Board of Trade inquiry that is being held by Major Pringle. The witness's statement, according to the newspaper reports, was: "As soon as the collision occurred, he saw a "monster flash, as if all the gas from the cylinders under "the train had become ignited. The flash was succeeded "by darkness; it only lasted an instant. He heard no "report." Subsequently, "he went to the back of the "carriage which was partially wrecked after the engine had "run through the van, and he noticed no fire then." Due weight must be given to this evidence, as well as to that of the sleeping-car attendants. One of these says that "the first fire he noticed was a few yards in front of the "buffer beam of the engine, and seemed to be at a higher "level than the floor. He thought the seat of the fire was "in the midst of a large quantity of broken baggage and "boxes. This fire he believed he succeeded in putting out. ". . . Some time elapsed before he saw more fire. Then "the fire rapidly grew in strength." The second sleeping-car attendant says it was a quarter of an hour before he noticed a slight fire. In his evidence, Samuel Caudle, the driver of the colliding engine, stated that he was certain there was a smouldering fire when he left the engine. "That," remarked Major Pringle, "looks like being caused by ash, "does it not?" Witness replied in the affirmative, adding that there was also a fire like a gaslight burning among some fragments lying a few yards in front of the engine frame. He thought it looked like a gas-fire, but he did not take much note of it. This evidence is all compatible with the points made as to the escape of the gas, and as to the fire being caused by scattered red-hot cinders and the dry combustibles in the midst of which they were thrown.

Where is there, in all this testimony of spectators and railway men, a single fact to support the theory that gas had anything to do with contributing to the starting, or to the severity, of the fire? The evidence opposes itself to the

hypothesis of the newspaper writers, and those interested electrical men who have been prejudging the whole matter (without using their brains) from their desks and from non-technical reports. But while saying this, let it not be imagined that we should defend the use of gas, carried in high-pressure storage cylinders under travelling coaches, if we really believed that, with a properly constructed system, it was a source of danger. We have not yet seen the evidence to convince us of the danger. If it is not conclusively proved that gas so transported is dangerous, then the travelling public ought not to be denied its reliability and the quality of its illumination. Up to the present time, there has been no thorough investigation of the allegations by independent specialists. We do not for one moment question the *bona fides* of the Inspectors of the Railway Department of the Board of Trade; but they, like other men, cannot claim to be experts in all matters.

Gas Progress in Melbourne.

The report of the proceedings at the last half-yearly meeting of the Metropolitan Gas Company of Melbourne, which appears elsewhere, forms, so to speak, a second chapter in the history of gas supply at the Antipodes which was commenced last week with the particulars given by the Chairman of the Australian Gas Company at their annual meeting. It furnishes additional evidence of progress in the business of gas supply. The total sales of the Melbourne Company in the six months ended the 30th of June were 1237 million cubic feet—the highest for any half year in the Company's history—and 132 millions, or 12 per cent., more than in the corresponding period of last year. Though the price of gas was 5d. per 1000 cubic feet less in the past six months than in the first half of 1912, the revenue from the sales was £276,338, compared with £266,349. A further reduction to the extent of 2½d. per 1000 cubic feet, making the price 4s. 4½d., is now in force, and will no doubt lead to increased consumption. Cooking by gas is at present in use by 60,000 consumers in Melbourne and the suburbs; and though the gas-fire has not been so largely adopted as the cooker, its value is now becoming more generally recognized and appreciated. This is shown by the fact that 1484 fires were sold and fixed during the past half year, compared with 762 in the corresponding six months of 1912. Another help to the sales of gas is the bath-heater. The increased output of gas necessitates plant of the highest productive capacity; and as the Dessau vertical retorts which have been in use continuously for the past twelve months in the South Melbourne works have given entire satisfaction, the Directors have now decided to increase the installation, at a total cost, with accessory plant, of £105,000. The Company have sustained a loss by the death of their Consulting Engineer, Mr. R. O. Thompson, who, after holding the position of Engineer for more than a quarter-of-a-century, relinquished it six years ago in favour of Mr. Philip C. Holmes Hunt, M.Inst.C.E., who, as will be gathered from an announcement appearing elsewhere, is about to vacate it. The Company passed through a trying ordeal during the public inquiry into their affairs some months ago; but it served to show the capacity of the chief officers. The strain, however, told upon the Secretary (Mr. Hinde), who has been granted six months' leave of absence, and is now in England. The Company have already a good record; it only remains for all connected with the working of it—Directors, officers, and employees—to unite cordially in placing it in a still higher position.

Saving Time (?).

The North British Association last week at Greenock repeated their experiment of last year, and had all their three papers read in quick succession before lunch, the discussions on them taking place simultaneously later in the day. The only "advantage" of this scheme seems to be the so-called saving of time. No doubt much delay and waste of time are avoided; and they did not suffer last week from the usual District Association complaint of having to rush things at the end, or even leave some papers quite undiscussed. But it does lead to great confusion; and after the meeting many complaints on the subject were overheard. To make matters even worse on this occasion, all three papers were on kindred subjects—all, in fact, dealing with the sale of the finished product. Moreover, between the reading of the papers and the discussion upon them, there came a long interval for lunch, and the most interesting William Young "Memorial Lecture" given by Dr. W. B. Davidson. There was no official distribution of prints of two of the papers beforehand; and the opinion was even expressed in one quarter that, had not a few odd proofs found their way round, there would have been no discussion at all.

A Questionable Advantage.

As it was, members wishing to speak had to make copious notes, and then bring out points which were no longer fresh in their memory. A speaker, for instance, would say he wished to mention a point in Mr. So-and-so's paper, and it was hard to remember which subject this special paper dealt with, when they were all three of much the same nature. Then the reader of the paper had to sort out, so to speak, the comments in the discussion, and find which he was expected to answer. Altogether, it was most confusing to follow. It is true there was quite a murmur of approval in the hall when the President announced that the Committee had decided on this method of procedure. The real cause of this murmur was, however, revealed later, when Dr. Davidson had finished his lecture, and the discussion was about to begin. For a large number of members promptly rose and made a straight line for the door. No doubt the scheme suits those members admirably who wish to hear the papers read, but are not in the least concerned with the discussions. But it seems almost questionable whether it is in the best interests of the Association to adopt this system permanently, and whether it is calculated to draw out the best possible discussion.

Proof of Progress.

The remarkable progress of the gas industry during recent years is excellently illustrated by a diagram given in the current issue of the "Birmingham Gas Department Magazine." This diagram shows the sales of gas during the past decade by the seven provincial undertakings making over 2000 million cubic feet of gas per annum which have enjoyed the highest percentage of increase. The highest average annual increases over this period are shown by Sheffield (6·2 per cent.) and Birmingham (4·3 per cent.). But the line on the diagram indicates that the progress made by the latter undertaking during the last three years has been really wonderful. While weather and local trade conditions have undoubtedly a big bearing on gas sales, it is pointed out that a close examination of the figures seems to prove conclusively that the question of price is all-important. It is only natural that this should be the case everywhere, but especially is it likely to be so in places where possibilities exist of large demands for industrial purposes. In fact, one would expect just what the writer of the article in the "Magazine" says the figures show—that most rate reductions have been immediately followed by a sharper upward turn of the line representing the total quantity of gas sold, and that the quantity of gas sold per consumer is greater in those areas in which the rates per 1000 cubic feet are being kept low.

Two Candles per Watt-Hour.

The much talked-of half-watt-hour per candle electric lamp has been on view; and the Electrical Press representatives are now satisfied that there is something real in it. So far, this is satisfactory from their point of view; but the arc lamp people and the suppliers of electricity are not altogether pleased. The former see a vanishing of a further part of their business, which has been keenly injured by the effectiveness of high-pressure gas, as well as by metallic filament lamps arranged in clusters. The electricity suppliers see a serious loss of revenue if the lamp makers succeed in getting the higher efficiency down to the lower lamp units. The new lamps at the outset will be made (so it is understood) in units ranging from 300 candle power up to 1500 or 1600 candle power; and it is expected that they will be on the market in a few months' time. It is believed that they will form an effective weapon in the fight with gas where the larger power units of light are required. Perhaps they will be where the best use is not made of high-pressure gas-lamps and the newest types of low-pressure high-power lamps. If all that is said is true of the coming half-watt-hour lamps, they will make the competition between the two illuminants keener where high candle power units are desired. But more high-pressure gas-mains will be laid, and there will be greater activity with the newest forms of the low-pressure high-power

lamps. We know of a few towns where a fresh campaign among shopkeepers, street-lighting authorities, and those controlling illumination for other purposes is much overdue. We hope that the new lamp will promote something more than the lukewarm measures that have hitherto been taken in these towns. The new lamps promise in energy consumption to be better than anything yet accomplished with metallic filament lamps; but their efficiency falls short of that of modern arc lamps. There are, however, no carbons to buy, and no trimming to be done. The life of the lamps is only predicted at 1000 hours. What their final cost will be will depend on their initial expense and durability. About these things nothing definite is yet known. Some further details appear in our "Electric Supply Memoranda."

The Minimum Wage.

In connection with the resolutions at last week's Trades Union Congress (as noted in another column) it may be of interest to point out here that figures have been published by the Liberty and Property Defence League showing the results which would follow upon the application to five great industries (including iron and steel and general and electrical engineering) of a minimum of 30s. a week for adult employees, and of 20s. for youths and girls. In the case of two trades (they refer, it should be mentioned, to boots and clothing) it is calculated that, even without any expenditure on upkeep of buildings and machinery, the total proceeds of the industries would be insufficient to pay the revised wages bill. In the case of the cotton and iron and steel trades, there would be a deficit after deducting the costs of upkeep. The only one of the five to show a surplus would be general and electrical engineering, and even here it would be hardly more than ½ per cent. on the capital employed. If these calculations are correct, therefore, it must be understood that the fixing of the minimum wage referred to would necessitate still further rises in the selling prices of the commodities manufactured. And the figures, be it noted, are based on the bold supposition that, if the wages of those now earning less than 30s. are increased, persons earning more than the amount will be satisfied to go without a similar rise in their rate of pay.

The Government Chemist.

There is little of particular interest to "JOURNAL" readers in the report of the Government Chemist for the year to March 31 last. Among other things, the fact is recalled that, after a lapse of nearly forty years, the manufacture of sugar from beetroot was recommenced in this country last autumn in a factory erected at North Cantley, in Norfolk. Further on, it is noted that the stipulation that before receiving an old-age pension it is necessary the age of the applicant should be clearly established, is apparently still responsible in some cases for "faked" entries in family bibles, &c. A large number of samples of different things were examined for the Office of Works; and in the section referring to this it is remarked that dust from arc lamps which was stated to have caused injury to workmen by gaining access to the lungs, was found to consist mainly of carbon, silica, and sulphates of sodium and potassium. Twelve months ago, when noticing the first annual report of the Government Chemist (Dr. James J. Dobbie), some reference was made to the steps which led to the constitution of this new department. The number of examinations and analyses made during that year in London and the country was 345,181. In the past twelve months there has been some increase in the work; the total number of samples dealt with being 354,759.

Company Registrations and Liquidations.

The year 1912 appears to have been a busy one in the company promoting world, judging from figures contained in the report issued by the Board of Trade on matters within the Companies (Consolidation) Act, 1908. The total number of new companies registered in England and Wales during the twelve months was 6796, compared with 5959 in 1911. If there are deducted from this the 2062 companies which have gone into liquidation (excluding one case in which winding-up proceedings have been stayed, and four cases not registered under the Companies Acts), and the 1808 companies removed from the register on the ground that they are no longer carrying on business, the net increase during the year is 2926. The number of companies upon the register in England and Wales on Dec. 31, 1912 (excluding those which were in course of liquidation or removal from the register) was about 52,000. Among the companies licensed by the Board of Trade during the year to be registered with limited liability but without the addition of the word "limited" to the name (as being associations formed not for the purposes of profit), are the Association of Bituminous and other Paving Material Manufacturers (Incorporated). The power vested in the Board to appoint an auditor, if the appointment of auditors is not made at the annual general meeting of a company, was exercised in seven cases. Proceedings to enforce returns to the Registrar of Joint-Stock Companies, and to secure the filing of documents required by the Statute to be filed for public information, were taken in ten cases, in eight of which fines were imposed. The total nominal capital of the companies registered in the United Kingdom last year was £174,004,837; the average amount of the nominal capital of each company registered being £23,619. Speaking of capital, the following instance from among the companies against which winding-up orders were made may be quoted. The purchase price payable by the company for the property, &c., was £125,000 (of which £40,000 was payable in cash); and the liquidator has now re-sold the estates to the original vendor for about £14,000. Some of the names included in the list of companies dissolved or struck off the register in 1912 are given elsewhere.

The Melbourne Appointment.

It will be seen from our advertisement pages to-day that, consequent on the resignation by Mr. Philip Hunt of the engineership of the Metropolitan Gas Company of Melbourne, Australia, applications are invited for this most important position—possibly the most important of any position that has been vacant for many years. The report of the half-yearly meeting of the shareholders of the Company, appearing on p. 711 of to-day's "JOURNAL," shows that the business of the concern has been, and is now, rapidly extending—their total sales having increased from 1,162,000,000 cubic feet in the year 1902 to 2,322,000,000 cubic feet in the year 1912; while the sale for the half year ended June 30 last was 1,237,000,000 cubic feet, representing an increase of 12 per cent. over the corresponding period of last year. It is evident, therefore, that the Company need the services of a thoroughly qualified and competent Engineer with modern technical training. In this connection, it may be stated that Mr. John Hinde, the Secretary of the Company, is at present in England; and we understand that on his return to Australia (he leaves the end of this month) he will submit to the Board the names of a number of selected candidates. The final appointment will be made by the Board itself immediately on the Secretary reaching Melbourne.

Mr. William Ball, of Strood, Kent, a Director of the Rochester, Chatham, and Gillingham Gas Company, who died on July 21, aged 73, left estate of the gross value of £106,959, of which the net personalty has been sworn at £81,698.

The announcement was recently made of the death in Brooklyn, New York, of Mr. Robert W. Prosser. Deceased was an Englishman by birth, having been born in Birmingham in 1845; and early in life he entered the firm which was afterwards Tangyes Limited. In 1867, he went to New York, and having been for a time in the service of Messrs. R. D. Wood and Co., of Philadelphia, became associated with the Bartlett-Hayward Company, of Baltimore. His relations with this great undertaking were of the happiest. About ten years ago, owing to failing sight, his work in the drawing office was largely curtailed; but he was retained in a consulting capacity. The sight trouble, however, eventually became so serious as to necessitate the relinquishment, about three years ago, of all active business. Mr. Prosser was a member of the American Gaslight Association, but did not pass into the Institute.

The water purification plant of the Bethlehem City Water Company, at South Bethlehem (Pa.), was built in 1904, and is of the slow sand filtration type. The normal capacity of the plant is 4 million gallons a day. It consists of six units of scrubbers in concrete tanks 16 feet wide, 38 feet long, and 6 feet deep, and six units of slow sand filtration beds 16 feet wide, 152 feet long, and 6 feet deep. Water enters the bottom of the scrubber beds through 8-inch valves, and flows over a dwarf dividing-wall to the slow sand filters. After passing through the sand, the water goes through effluent pipes at the bottom into the filtered water reservoir. The scrubbers consist of a 9-inch layer of 3-inch pebble stones and a 9-inch layer of coke, and above this there is a 24-inch space filled with four rows of slates, placed at a slight angle upwardly, each row slanting in a contrary direction to the next. The space between the slates is filled with coke of nut size, and over the slate is an 18-inch layer of sponge held down by cedar slats. The final sand filters consist of 18 inches of gravel and 24 inches of sand; the water filtering through under a head of about 2 feet.

PERSONAL.

RESIGNATION OF MR. PHILIP C. HOLMES HUNT, M.INST.C.E.

In the report of the proceedings at the last meeting of the Metropolitan Gas Company of Melbourne which appears elsewhere, reference is made to the death of Mr. R. O. Thompson, who for a long period was the Engineer, and since his retirement in 1907 the Consulting Engineer, of the Company, and to the progress made under Mr. Philip C. Holmes Hunt, the present Engineer.

It may be remembered that Mr. Hunt was appointed Assistant-Engineer in 1902, and in 1906 was raised provisionally to the position of Acting Engineer. The Directors were so satisfied with him, that a year later the provisional appointment was confirmed. Since the report of the meeting was received, we learn that Mr. Hunt is about to relinquish the position in which he has achieved the excellent results that have from time to time been brought under the shareholders' notice, especially at their last meeting.

The reason for this step is, we understand, the acceptance by Mr. Hunt of offers of three directorates which have recently been relinquished by the Hon. G. Swinburne, the local Chairman of the Colonial Gas Association, as a condition of his appointment as one of three Interstate Commissioners, whose duties will be to adjudicate on all matters of difference relating to trade or commerce which may arise between the various Australian States. It will be seen, from the advertisement which appears elsewhere, that the Directors of the Melbourne Gas Company are seeking a suitable successor to Mr. Hunt in the important position he has so ably filled for the past seven years.

As mentioned in the notice of the proceedings at the recent meeting of the Tonbridge Gas Company which appeared last week, Mr. J. H. Donaldson, the nephew and assistant of Mr. J. Donaldson, the Engineer and Manager, has been appointed Engineer and Manager of the Sevenoaks Gas Company, in succession to the late Mr. W. J. Dougall.

Mr. John Wilson (son of Mr. Alex. Wilson, M.Inst.C.E., the Engineer and General Manager of the Glasgow Corporation Gas Department), Assistant Gas Manager at Falkirk, and President of the Western District Division of the Scottish Junior Gas Association, was married last Thursday, at the Grand Hotel, Glasgow, to Miss Young, daughter of Mr. and Mrs. William Young, of "Ardshiel," Glasgow.

Mr. Archibald Dougall, who for thirty-nine years has been Engineer and Manager of the Kidderminster Gas Company, recently tendered his resignation, which was accepted with regret by the Directors, who have appointed him Consulting Engineer and Secretary. His younger son, Mr. Percy Dougall, now the Engineer, Manager, and Secretary of the Newquay Gas Company, Limited, will fill the vacant position.

In another part of the "Journal" will be found an account of a farewell supper given by the Directors of the Waterford Gas Company to Mr. J. G. Tooms, the former Manager of the works, who left England last Friday for Buenos Ayres, to take the position of Engineer of the Primitiva Gas Company. Mr. Tooms was the recipient of an address and gifts from the Directors, staff, and workmen, and the South-East of Ireland Gas Managers. In addition, he was made an honorary member of the Tramore Golf Club, of which he was Hon. Secretary and Treasurer for many years; and the Waterford Golf Club, of which he was the founder, and whose links he constructed, presented him with an illuminated address and solid silver plate.

OBITUARY.

The death is announced of Mr. Thomas Greaves, who passed away, at the age of 74 years, last Tuesday morning, after a short illness. After thirty years' service with the Company he retired from the position of Manager of the Melton Mowbray Gas-Works in 1898. Three years later he became a member of the local Urban District Council, but did not subsequently seek re-election. Mr. Greaves, however, continued to reside in Melton until the time of his death.

The death occurred on the 30th ult. of Mr. Thomas Brown Younger, Assoc.M.Inst.C.E., who for many years was Engineer and Manager of the Georgetown (British Guiana) Gas Company. In July, 1896, he relinquished his position, and returned to England. The severance of his connection with the Company was at his own request, as his engagement would not otherwise have terminated till the close of 1897; but he was retained in the capacity of Consulting Engineer. During his residence in Georgetown, he became a very useful citizen. In addition to the management of the gas-works, he was Engineer of the East Coast Water Supply and a Valuator for the Town Council. About twelve years ago, the works were disposed of, and the Company's existence terminated. On returning to England, Mr. Younger became the representative of the Stirling Boiler Company, Limited. He joined the Gas Institute in 1882, but remained a member only a few years.

ELECTRICITY SUPPLY MEMORANDA.

Half-Watt Lamps on View.

The great talk that there has been regarding the coming of half-watt-hour per candle power metal filament lamps has been brought to a fresh point by an inspection of specimen lamps made by the British Thomson-Houston Company; and the electrical papers have published accounts of the new lamps very similar in the wording conveying the information. It seems that the half-watt lamp, or two candles per watt lamp, was developed in the research laboratory of the General Electric Company of Schenectady, N.Y. It will not, however, be produced on the commercial scale for some months yet; and so we have to wait till then to see whether the efficiency now ascribed will be actual and maintainable. It is well known what has happened in connection with the lamps that came on the market with a tag attached to them claiming an efficiency of one watt-hour per candle; that efficiency was never actually obtained in practice. The promised half-watt lamps are at first to be of from about 300 to 1500 candle power; and a useful life is asserted of 1000 hours. The lamps viewed were of 1300 to 1400 candle power; but whether the press men photometrically tested them is not stated. It appears, however, that there were energy-recording instruments attached, to satisfy as to the consumption. One paper declares that this was about half-watt per candle power; but it is not stated whether the same writer tested the candle power. The happy press men, however, were supplied with the following data as to the projected performances of the lamps:

Lamp No.	Amperes at 80 Volts.	Candle Power.	Efficiency. Watts per Candle.
1	9·2 ..	1400 ..	0·52
2	9·15 ..	1375 ..	0·53
3	9·1 ..	1260 ..	0 535
4	10·0 ..	1600 ..	0 5

One feature of the new lamp is the employment of a relatively short drawn tungsten filament, concentrated in a compact, closely-wound coil, and operating at a very high current density. The coil of filament is like a U or blunt V in shape, and only measures about 3½ inches from tip to tip. The arrangement gives the wire free play to adjust itself to expansion and contraction, and enables a great length of it to be got within little compass. The bulb of the lamp is about 8 inches in diameter; and it is filled with an inert gas—in the case of the lamps on view, with nitrogen. It is stated that this has a remarkable effect on the efficiency of the light from the tungsten filament. This is somewhat contrary to what one would have expected; but more is to be learned regarding the matter when patent procedure permits of the publication of further details. It is also stated that the light is white, and, in comparison, the ordinary tungsten lamp looks decidedly yellow. Another point is that the lamps on view were all of them being run on 80 volts, which suggests that the new lamps will have to be used in series.

Cheap Ridicule Not Argument.

"Meteor" of the "Electrical Times" plays the game badly. He had something of a very fantastic character to say the other week anent the failure of low-pressure gas, taking as the groundwork for his strange hypotheses some statements inappropriate to his case in the recent Institution paper by Messrs. E. W. Smith and C. M. Walter. To the exposure of his stupid blunders he has no argument to advance. He therefore descends into cheap ridicule; and, after the manner of most persons whose gossamer opinions are easily blown away, he takes refuge in pronouncing our criticism "pointless" and "largely incoherent." The pointlessness and the incoherency are on "Meteor's" side. We should have been more interested, and perhaps further amused, had he tried to justify his position by an attempted destruction of our argument. He still, however, persists in his hare-brained view that low-pressure gas is "coming to be acknowledged as a failure." By whom? By "Meteor," and him only. It is extraordinarily kind of him to show the experts of the gas industry what he considers to be the error of their ways, and to afford them amusement by pooh-poohing the gigantic commercial testimony to the fact that low-pressure gas is not a failure. He discards all the gas undertakings in the United Kingdom, and flies to Devonport for support. He says that for the year just reported the Devonport gas concern had a net loss of £3491; while the year before it had a net surplus of £1645. The net surplus on the electrical undertaking he says has meanwhile risen from £20 to £390. How wonderful! We do not see the difference in the position of the gas undertaking represented in the slight improvement in the position of the electrical concern. "Meteor" asks whether his critic can explain this strange tendency? His critic cannot from the place where he is writing; for he is far from the hum of London life and from Devonport. Of course, it is a "*strange* tendency." Perhaps "Meteor" can explain the "tendency" of the many hundred millions increase in gas consumption in the Metropolis during the past six or twelve months; and the 5, 6, 7, 8, and in some cases higher percentage increases in suburban gas business—this being the reflection of the position, with little exception, throughout the whole country. "Meteor" may not know it, but when gas engineers find in their

districts that pressures higher than those current are necessary, they can easily provide them from the works. They have not found them essential for ordinary purposes; hence the provision of high-pressure plant for special purposes in order to maintain normal pressures for ordinary uses. Our friend is a person with singular views where gas technics are concerned.

Unsafety.

The subject of electrical troubles seems to have been again brought rather prominently to the front of late, by fatalities and other accidents. It was seen in our issue a fortnight since that certain recent upheavals, accompanied by life and property destruction, have done something at last to produce a scientific if unofficial, investigation into the generation of gas from bitumen. It was shown how a vaporous gas is generated by the electric heating of the bitumen-covered cables and wires, and how the vapour is cracked-up into a gas of a highly sensitive and explosive character by passing over a length of cable which has been brought to high temperature by the fusing. It is time that electricity came into its own in this connection, and carried the consequences of its own misdeeds in this respect, which for a long time it had the audacity to pass over to the broader shoulders of its competitor. Then we have had it forcibly brought home to us, that masses of rules and regulations for bringing electrical installations up to the highest attainable degree of perfection are of no use whatever for effecting their purpose, unless there is proper supervision. The Home Office have, with the revision of their rules and regulations for collieries and mines, adopted sharper procedure in this regard; and certain collieries have felt the just severity of the law upon those who neglect the precautionary rules. Speaking of the steps taken to compel people to do what is right and proper, there have been one or two disasters in mines lately which have caused a revival of restlessness in certain localities among the colliers as to the danger of electricity in mines through sparking and fusings. The electrical papers deride this trouble among the men; but we have yet to learn why fusings should take place in the mansion and private house and factory, and sparking where motors are employed in factories and workshops (including such dangerous places as saw-mills), and not in mines. We know about armour-proofed devices and so forth; and we know where trouble has arisen with the highest possible supervision in installation. In gas-works where in purifier-houses a naked light is not allowed, there have been installations of electric lamps for the purpose of preventing the trouble of gas ignition. The very step that was taken, at Dublin (and possibly elsewhere), so as to obviate trouble was the direct cause of explosion. At the Rochester Gas-Works on the 15th ult., owing to the fusion of an electric wire used in connection with the retort-house machinery, there was an explosion of coal dust which did considerable damage, and caused bodily harm to an employee. In these instances, there was reproduced part only of the conditions existing in a coal mine; yet there was trouble.

Suffragettes or Electric Wires.

No one knows precisely the full measure of the delinquencies of electric wiring in creating fires and in destroying property The statistics that are available show a portly amount of destruction; but there are an immense number of fires with "cause unknown" affixed to the narrative of events. There are numerous fires in which electrical fusion is believed to be the cause; and there is no question that the suspicion is not ill-founded in all cases. We are half inclined to think, too, that certain of the fires of which suffragettes have been suspected as the authors might as well, so far as the evidence has gone, have been attributed to electrical fusion. There was the fire at North Finchley the other day, when the east wing of a fine old mansion was much damaged by fire. A distance away was discovered a copy of the "Suffragette." But the fire was discovered inside the house in the dining-room. The caretaker was awakened by the ringing of an electric bell outside his living-room door. The ringing of the bell, the caretaker states, was caused by the fusing of electric wires. By the appearance of the fire, it was his impression that the room had been ignited in several places. We are not informed as to the lighting equipment of the house; but if it is electrically wired, these statements of the caretaker would suggest that there should be close investigation to ascertain whether electric wires or suffragettes were the more responsible. Suffragettes ought not to be blamed for anything more than their own sins; equally electric wiring ought not to be blamed for more than its full share of fire-raising. When there is no direct evidence, but there is circumstantial evidence, the latter cannot fail to make one a bit suspicious in the direction in which it points an incriminating finger.

Property-Owners Beware.

We have seen lately how the Marylebone Electricity Department has been convicted of improper work in connection with a private installation—that is to say, work not carried out in compliance with the rules and regulations of the Institution of Electrical Engineers, although a tip-top charge was made for what was done. When householders hear of these things, it is enough to make them more than a little dubious. In whom are they to rely, if not in the well-paid officers of such a department as that at Marylebone. The officers may not have done the work in question; they may not have supervised it; but we guess they must have had something to do with advising the Electricity Committee to act on the defensive, and to carry the dispute to arbitration. In the Provinces time and again there appear in the papers allegations of shoddy work on the part of either electricity supply concerns or contractors. The subject of shoddy wiring work in Sheffield has been in the correspondence columns of one of the local papers; and there has been a good deal of acerbity displayed by the writers. It seems that considerations of cost are at the bottom of the shoddy work question in Sheffield; and despite rules and regulations there are apparently contractors who look upon them as sheer "rot." One of them, for instance, says that he fails to see the advantage of earthing; and the "Electrical Times," which was once great on "flex." and cheaper wiring, says how any competent contractor can hold such views in the face of universal experience and expert opinion, it is impossible to understand. Our contemporary also now says that "considerations of cost ought to take a very secondary place in comparison with safety; and property owners in Sheffield [we may add 'and elsewhere'] would be well-advised to keep clear of so-called contractors who are prepared to sacrifice everything to cheapness." And a little later on it is remarked that "it is certain that, if the fire insurance companies concerned had their application forms correctly filled up, they would in such cases refuse to issue a policy." "Can nothing be done," plaintively asks our contemporary, "to enforce the observance of the Institution of Electrical Engineers' rules?" The same question has been asked scores of times before; and nothing but a mocking laugh is heard in reply, with echoes in electrical disasters in the most unexpected of places, and at the most unexpected of times.

Fatalities.

There have been several fresh electrical fatalities lately. Among the more notable ones, there was the death of a steam lorry driver in the employ of Messrs. Lee, of Sowerby Bridge. He had been engaged in repairing a steam-motor lorry; and he was found with his head thrown backwards, and his hands hanging down. He was groaning, and behind his ears and neck the skin was blue. An electric lamp wire was resting on his left shoulder. The voltage was only 230. Accidental death caused by electric shock was the verdict. A man engaged as an electric wireman employed by Messrs. Beyer, Peacock, and Co., of Gorton, touched a live cable and fell from a ladder. He died later. His left hand was burnt in such a way as to suggest an electric shock. Two miners were killed recently at Moor Green Colliery, Nottingham. A gang of men were working at an electric coal-cutting machine, when two of them received an electric shock. One of the men was killed as the result of the shock. The other was thrown on to the machine, with a result too horrible to describe. These are among recent records of trouble.

The Graetzin Light.

There has been forwarded to us by the British Graetzin Light, Limited, of Chapter Street, Westminster, S.W., a newly issued complete catalogue of their specialities for low-pressure gas—embracing burners, lamps, &c., suitable for indoor and outdoor lighting. The Graetzin lamp is already well known; and it is not necessary to do more here than to point to the claim of the Company that it has been their sole aim to give to the consumer a perfected, scientifically constructed lamp, having the highest efficiency with least breakages of mantles and glassware. The early pages of the catalogue contain a comparison between an upright incandescent Graetzin light of 100-120 candle power and electricity; and the figures given show that the cost of lighting by the most economical metallic filament lamp is five times greater than that of the Graetzin light. The list is fully illustrated. Among the many patterns of lamps are noticed some for semi-indirect lighting, and others with decorated glass bead hangings. There are, in fact, lamps to suit all sorts of requirements; and the value of the catalogue is enhanced by the inclusion of full directions for their use.

Discoloration of Sulphate of Ammonia.—In a recent issue of "L'Industria Chimica" [No. 13, 1913], Sig. I. Ceruti dealt with the subject of the influence of nitrous compounds in sulphuric acid on the colour of sulphate of ammonia from gas liquor. According to an abstract of the article in the "Journal of the Society of Chemical Industry," the nitrous compounds interact with volatile organic impurities from the liquor, with the formation of coloured substances.

Deterioration of Fire-Brick during Service.—This was the subject of a communication by Mr. G. Rigg to the "Journal of Industrial and Engineering Chemistry" [No. 5, 1913]. The author discusses, according to an abstract in the "Journal of the Society of Chemical Industry," the causes of the deterioration of fire-bricks during use, and concludes that, other things being equal, the resistance to the action of corrosive slags and gases is greater the more compact and close-textured the brick is. "Spalling" of close-textured brick is due to the use of unsuitable clay or poor workmanship, or to both. It is possible to prepare close-textured fire-brick containing considerable amounts of coarse material, provided that sufficient care is taken in sizing the "grog," so that the interstices between the larger fragments shall be filled as completely as possible by smaller fragments.

INTERNATIONAL ILLUMINATION COMMISSION.

The Berlin Meeting.

In the last number of the "Journal" (p. 607), we gave a summary of the proceedings at the recent meeting, held in Berlin, of delegates from the technical gas, electricity, and illuminating institutions of nine different countries, to formulate statutes for an International Commission on Illumination. It was then mentioned that the Commission was duly formed, and that Mr. Clifford C. Paterson, of the National Physical Laboratory, was elected Hon. Secretary. We have received from Mr. Paterson the following particulars as to the meeting, and give them to supplement officially those which have already appeared.

The International Photometric Commission—sometimes spoken of as the Zurich Commission—was founded in 1900 by representatives of the gas industries of America, Austria, Belgium, France, Germany, Great Britain, Holland, Hungary, Italy, and Switzerland, and has occupied itself up to now mainly with technical matters having a direct bearing on the gas industry. It has, however, been widely felt for some time, both inside and outside the Commission, that international matters relating to illumination should receive consideration by a body which is representative of electric and other interests besides that of gas. This object might have been achieved by the formation of an entirely new international body; but it has happily been found possible so to enlarge and reconstitute the existing Photometric Commission that it will now be representative, in the broadest sense, of all institutions and societies associated with the science or practice of illumination. The range of work is to be as wide as the subject of illumination itself, saving only those phases which may be described as commercial rather than technical.

The affiliated gas societies having previously agreed to the enlargement of the Commission, a very representative number of delegates—totalling 45 from all the affiliated countries—met in Berlin from the 27th to the 30th of August to discuss and agree upon the new statutes of the enlarged Commission. The British delegates were: From the Institution of Gas Engineers, Dr. Harold G. Colman and Mr. W. J. Atkinson Butterfield; from the Institution of Electrical Engineers, the President (Mr. W. Duddell, F.R.S.) and Mr. Edgcumbe; from the Illuminating Engineering Society, Mr. Leon Gaster and Mr. le Maistre; and from the National Physical Laboratory, Mr. Clifford C. Paterson. Well-known delegates from other countries included Drs. Hyde, Kennelly, Bell, and Sharp, from America; M. Vautier, the President of the Commission, Drs. Broca, Bunte, Brodhun, Professor Feltmann, and many others.

After four days' discussion and hard work, the new statutes were unanimously agreed upon; and it speaks well for the future of the Commission that the earnest desire to co-operate internationally in the cause of good lighting was strong enough to reconcile and harmonize so many divergent interests, both technical and national.

The Commission is now to be called the "International Illumination Commission;" and representation is to be through the medium of National Committees on Illumination in all countries affiliated with it. Each country has only one vote in all international decisions, irrespective of the number of delegates sent; and the contribution from all countries is to be identical in amount.

Perhaps the greatest step forward, from the point of view of international bodies, is on the language question, since one language (French) has been made the basal language in which all formal resolutions and documents are to be drafted and published. Translations from the French may be made into any language by a National Committee; but such translations are only of secondary importance. English, French, and German are to be allowed in all discussions, in which the assistance of an interpreter will, of course, be required. Arrangements were made at the close of the meeting for appointing Committees to consider various technical subjects; so that the real work of the Commission may begin as soon as the new constitution has been approved by the bodies which appointed the delegates.

The officers of the Commission (elected for three years) are the President, Treasurer, and Hon. Secretary, assisted by a paid Secretary. M. Vautier, of Lyons, was elected first President—a recognition of his arduous work as President of the old Commission; Herr Weiss, of Zürich, becomes Treasurer, and Mr. Clifford C. Paterson, of the National Physical Laboratory, was elected Hon. Secretary. The "Bureau" of the new Commission will consequently be located in London. The Vice-Presidents are Drs. Bunte, Hyde, and Kusminsky.

The satisfactory result of the Berlin meeting was only achieved after much preparatory work by individuals in all the countries concerned, and by the sincere desire of the delegates to reach a solution which would generally be acceptable in all the countries concerned.

The late Mr. James Cloudsley, one of the Directors of the Tottenham and Edmonton Gas Company, whose death was recorded in the "Journal" for the 22nd of July, left estate of the gross value of £34,127 gross, with net personalty amounting to £32,117.

TRADES UNION CONGRESS.

The Manchester Gathering.

There is usually a big *agenda* submitted at the annual Trades Union Congress; and this year's gathering—which took place in Manchester—proved no exception to the rule, for there were no less than eighty-six resolutions notified. It was the forty-sixth congress; and there assembled to take part in it 557 delegates, representing 206 societies and 2,232,446 trade unionists. This is an increase on the previous year, when, at Newport (Mon.), some 500 delegates represented 1,971,109 members of trade unions. Last week's gathering was presided over by Mr. W. J. Davis, of Birmingham; and at the opening of Monday's proceedings, the delegates were welcomed to Manchester by Mr. J. R. Clynes, M.P., and Mr. J. E. Sutton, M.P. The Lord Mayor (Sir Walter Royse) was not well enough to attend then; but he was present at a reception held in the Town Hall that evening. As a matter of fact, the business opened with the reading of a number of messages of regret for absence; and one or two of the remarks of delegates were of a caustic nature. When the Lord Mayor did meet the visitors, he expressed the hope that in their deliberations they would have kind consideration for the employers as well as for the workmen.

Business in earnest commenced when the President rose to deliver his address, which reflected his satisfaction with the progress made by Labour since the establishment of the congress. Some attention was next devoted to political considerations; and then statistics were given to show that Great Britain is still in the front rank of the great commercial countries in the matter of the proportion of organized to unorganized labour. The figures of trade unionists which were quoted were as follows: Britain, 22 per cent., or 3,010,000 members; Germany, 22 per cent., or 3,061,000 members; France, 9 per cent., or 1,029,000 members; Belgium, 14 per cent., or 199,000 members; Holland, 20 per cent., or 154,000 members; Norway, 26 per cent., or 54,000 members; Denmark, 30 per cent., or 128,000 members; and the United States of America, 10 per cent., or 2,283,000 members. Everywhere, it will be noticed—though to show this was not the object of the figures—that the non-unionists form the great majority of the workers. Even in this country, the trade unionists can only claim to speak on behalf of about one in five of the workers. After touching upon the eight-hour day, Mr. Davis concluded by remarking that, while to forecast the future or to suggest programmes was somewhat like building castles in the air, most assuredly vested interests must be prepared to surrender to the people who so largely contribute to the nation's prosperity that which is overdue. To co-ordinate the rights and responsibilities of property might, he added, shock the holders of capital; but, if he had not misread the signs, "the time is fast approaching when those who can best afford it will not be permitted to escape by contributing less than their proportion to the national burdens, but will have to meet taxation commensurate with their accidental or fortunate financial holdings."

The unhappy rioting in Dublin was discussed at length during the proceedings at the afternoon's sitting; and the conference unanimously passed a resolution condemning the authorities, and calling upon the Chief Secretary for Ireland to re-establish at once the right of public meeting and to institute a rigid inquiry into the conduct of the police. By those who have read some of the speeches recently delivered in the Irish Capital little surprise will be felt that those in authority should have taken steps to dam the flood of eloquence; while as for the inquiry into the conduct of the police, this is generally desired, under the firm conviction, by most people, that it will end in the complete vindication of the constables as a body in connection with the charges which have been brought against them in certain quarters. That rioting should have followed on preceding events was no more than might reasonably have been expected; and fortunately the trouble when it arose found the representatives of law and order prepared.

The Parliamentary Committee's report (it is always a bulky document) was considered on the second day; the statement of nearly a hundred pages being submitted page by page. Ballots on questions regarding an eight-hour day, by twenty societies, showed a big majority in favour of the suggestion; the largest measure of support being accorded to a proposal that the Parliamentary Committee should press forward an Eight-Hour Bill—thus supporting industrial action by political action—so as to make a general eight-hour day the law of the land. Mr. Will Thorne, M.P., said there seemed to be too many sectional trade union Bills on the eight-hour question; and they were getting into a state of absolute confusion. If, however, the eight-hour day was obtained, he warned his hearers, it would not be for the purpose of giving men a better chance of working overtime—an idea which was undoubtedly at the back of the minds of a great number of them. As bearing on the eight-hour system, the same speaker referred to the unfortunate fate of the Thames Iron-Works, and expressed alarm at the probability of the undertaking being handed over to a syndicate "which may endeavour to impose upon the workpeople a 53-hour working week." Mr. Ben Tillett, too, agreed that the clock had been put back generally by the failure to maintain the position of the Thames Iron-Works. The men in the riverside districts of London must indeed be enamoured of the eight-hour principle if they prefer no work at all to a 53-hour week.

By resolution the congress re-affirmed their conviction that the nationalization of all railways is desirable in the interests of the community; but for the first time in the last fifteen years—this presumably being the period during which the question has been more or less to the front—a word against nationalization was heard from the railwaymen's organization. This opposition, it should be said, was of a merely personal character, as the delegate admitted that he had been instructed by his branch to vote for the resolution. When the members met on Wednesday, some additions were made to the delegates previously appointed by the congress to proceed to Dublin in connection with the labour troubles there. Thereafter a resolution was adopted declaring that, in view of the continued hold of consumption and other pulmonary diseases upon clerks, due to the unhealthy conditions under which they have to work, "all offices and places in which clerks have to work should be brought within the scope of the Factory Acts as soon as possible." The fair wages clause in Government contracts was the subject of several resolutions; one of them expressing the opinion that, for the purposes of the clause, clerks and all wage-earners should be included in the term "workmen."

The Trade Unions Act, 1913, was the subject of a long and interesting discussion, on a motion calling the special attention of British organized labour to the vital importance of the ballot now being taken under the Act, which will determine whether political activities shall form a part of the objects and functions of the various trade societies. It was pointed out that, under this measure, before trade unions could use their money for political purposes, they must comply with certain forms and regulations. The first step was to take a ballot of the members upon the question whether money should be spent on political action. In the course of the debate, the Act came in for a good deal of criticism. One delegate expressed the opinion that, even though the ballot might show a majority in favour of spending money on political action, when the Tory, Liberal, and extreme Socialist members were asked to pay the only answer would be an application for exemption. Another member, also alluding to the ballot, thought they were likely "to be duped in this way as they had been duped before." He foresaw a great danger of there being such a poor response to the appeal for a levy as would belittle and bring into contempt their political activities. Evidently this fear that the result of the ballot may show the Osborne judgment to have many more friends in the unions than the Labour Members would have one believe, is at the bottom of a great deal of the dislike felt for the Trade Unions Act, 1913. Mr. Clynes said the Act was the utmost measure of freedom that organized labour could secure; but the remarks of its supporters read very much like an apology on behalf of the Labour Party for having failed to get the complete reversal of the Osborne judgment which was originally demanded. This matter done with, the strike disturbances in Cornwall were introduced, and once more an early inquiry into the conduct of the police was demanded.

The first resolution discussed on Thursday (at which sitting the foreign delegates were cordially welcomed) was rejected by a large majority, after it had been shown by one speaker that it would likely prove to be a double-edged sword, and another had remarked that under it they would never be out of the Law Courts. The proposal thus defeated was that rates of wages, the regulation of hours, and other conditions embodied in agreements of a local, district, or national character, voluntarily entered into between trade unions, as representing the workers, and the representatives of employers in a given industry, should be legally enforceable on all persons employing labour in that industry. Better luck, perhaps naturally, attended a by no means novel kind of resolution in favour of a minimum wage for all adult workers; and the same remark applies to one declaring in favour of the trade unions taking early and simultaneous action to obtain an increase of 5s. a week for all grades of time and piece workers in both public and private employ. A more practical idea agreed to was that, in order to secure unity of action by affiliated societies, a specified period should be adopted for the operation of all agreements between such societies and employers' associations. Then the minimum wage came forward once more, and previous decisions were re-affirmed in favour of the establishment of a 30s. minimum wage for all adult male workers. A weak point about the minimum wage demand was revealed by Mr. Will Thorne himself, in the remark that, when the National Union of Clerks sent men to do clerical work for other unions, and asked that they should be paid 35s. a week, the National Union should see that the men were competent to do the work required. Some of the men they had sent along, he added, were "more fitted to drive the shovel than the pen." The congress adjourned after defeating a proposal for the appointment of an Industrial Committee to conduct a statistical department, to suggest schemes for reducing the enormous number of unions, to report on the want of uniformity in wages and working conditions, and to carry on the trade union propaganda.

The lamentable railway accident on the border of Cumberland was the subject of a resolution on the following day; but by the time it was passed the fact became known that the authorities had realized that the inquiry into the causes which contributed to the disaster ought to be held with open doors. Amendment of the Workmen's Compensation Act and the National Insurance Act was subsequently demanded, and a distaste for the system of fines was unanimously manifested. Legislation was asked for to compel payment of wages for all statutory holidays, and also to prevent employers from evicting the workmen from their homes during any trade dispute. Once more, the nationalization of mines, minerals, railways, and lands was asked for; and various electoral questions were then discussed.

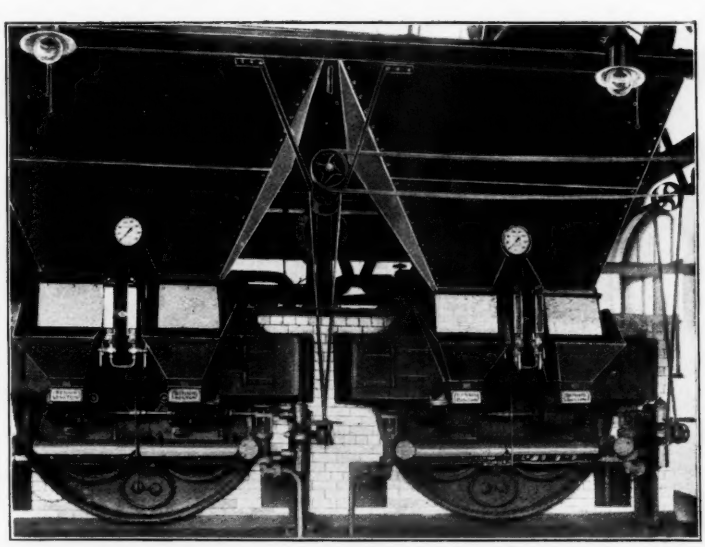
It was announced at the final sitting of the congress on Saturday that next year's gathering would be held at Southampton. Among the various resolutions passed before the delegates separated (to ponder over the probable outcome of the week's deliberations) was one declaring that the congress, "being unalterably opposed to any attempts to separate the workers of the world by geographical boundaries, racial prejudices, and capitalistic profit-making, entered its emphatic protest against any efforts to create ill-feeling between the nations of the world by unnecessary armaments." Mr. Thorne, who proposed this resolution, is reported to have said the growing expenditure on armaments should be put on the shoulders of the moneyed classes. If by this he meant to argue that the capitalists have a greater interest than others in the welfare of the Empire, it is a train of reasoning that might conceivably prove awkward to his party if it came to be applied generally.

MACHINE-STOKED BOILERS AT THE WEST BROMWICH GAS-WORKS.

We reproduce an interesting photograph of part of the boiler-house plant installed in the gas-works at West Bromwich, where it is claimed that the "Bennis" machine stokers and storage hoppers are "excellent inducers of economy." The output of gas at the works is approximately 380 million cubic feet per annum. The fuel generally used is small coke dust from the coke breaking and sizing plant, and is practically a waste product. This coke dust is treated with a small quantity of tar in a mixing machine, or a mixture of coke dust (without tar) with fine slack is equally effective.

The boilers are used for water-gas production, and also for general works' purposes. The fuel is taken up in tipping waggons, of one cubic yard capacity each, on a hydraulic hoist, and deposited in the hoppers seen in the photograph. The boilers are fitted with an automatic feed regulator; and the waste products are discharged into the atmosphere through a short flue-pipe by means of an induced draught fan. The speed of the engine driving both the fan and the stoking machines is regulated automatically by a small apparatus controlled by boiler pressure.

Mr. Harold E. Copp, the Engineer and Manager of the works, writes: "The entire installation is most effective, and has been of interest to many engineers." If there is any reader of the "Journal" who would care to see the plant in operation, he is invited to communicate with Mr. Copp, who is proud of the economies induced, and will doubtless afford facilities for an inspection.



Bennis Machine Stokers in the Boiler-House of the West Bromwich Gas-Works.

WELSBACH LIGHT COMPANY'S NOVELTIES.

An inspection of the spacious show-rooms of the Welsbach Light Company, Limited, at King's Cross, W.C., will afford convincing proof that they have well equipped themselves to meet the demands which past experience and the present excellent condition of the gas business justly lead them to anticipate will be made upon them during the forthcoming lighting season. Such an inspection was made by the writer one day last week; and he was then shown by the staff a greater number of promising "lines" than there is space here to detail.

The Company's business, it is hardly necessary to mention, covers a very wide field. In the first place there are mantles, with which, of course, the name of the Welsbach Company has always been most closely allied. The range of these goods is now about double that of last year. One or two fresh kinds are listed, and various new high-pressure mantles. But, in the main, the additions are in the direction of affording a wider choice of prices. The proportion of inverted burner business transacted, one learns, continues to increase; and one of the novelties is a new series of "Aurora" burners, for interior or lobby lighting. These are pleasing in appearance, whether in the decorative casing of polished brass or the white enamelled casing with gold lines. In the latter style they are made in two weights; and they are fitted with new type gas-adjuster, air-regulator, and dust trap. With a consumption of 4 cubic feet per hour, they are well fitted for the purposes for which they have been designed. The Kern burner, too, is seen this year in a greatly extended range, with all the renewal parts; and the same remark applies also to the "C" burner. With so many different lamps as the Company sell, a

AN INSTALLATION OF "PHAROS-WELSBACH" HIGH-PRESSURE LAMPS.
(Paradise Street, Birmingham.)

New Model Welsbach-Kern Radiator.

varied assortment of glassware is called for—and is provided; while as for shades, they are to be had in all imaginable sizes, shapes, and colours. Some are in silk, and others in goffered linen and figured chintz; many are provided with light bead fringes. And however much tastes may differ, there must be something among them to please all. And the same thing with regard to prices—any pocket may be suited; for the prices range from a very few shillings upwards. The beaded fringes pure and simple still retain their popularity; and they are stocked in innumerable patterns, and at many different prices. New one, two, and three light pendants, in neat patterns, are displayed in the show-rooms, as well as a series of fittings for semi indirect lighting.

Turning to outdoor lamps, special mention may be made of two inverted burner series. In the first place, there is the "Parade" lamp (supported on a wrought-iron harp) for promenade and street lighting, in the design of which care has been taken to secure an absolutely weather-proof article. They are made in one, two, or three light sizes, in steel (with a very attractive grey enamel finish) or copper. To get at the interior of the lamp, the hinged top is raised; and everything is arranged to secure perfect diffusion of light over the greatest possible area. No inner glasses are used; there being substituted for these white enamelled steel collars, which create a draught and so intensify the light. The brass burners are of substantial make; and a point about the gas-regulators is that they are fitted with a key-head, and a key is provided in each lamp-head, so that, when once adjusted, the regulation cannot be accidentally altered. The stated lighting power is about 120 candles per burner, with a consumption of $3\frac{1}{2}$ cubic feet of gas per hour. Another series, arranged for suspension, and of very business-like appearance, is found in the "Emperor" self-intensifying high-power outdoor lamps, which are provided with black enamelled steel casings and pear-shaped globes. The same trouble has been taken with these as with the first-mentioned design to make them thoroughly weather-proof,

and they are supplied in from one to four light sizes. These lamps can be had with top levers, in which case all the lights are on or off; or (in the multiple burner sizes) with a side swing lever and switch-cock arrangement, by which means a portion of the burners may be left on and the rest shut off, or all turned on or off. With the side-levers, there is provision for re-lighting the burners from outside the casing, without opening the globe.

The Welsbach Company have, it may be remarked, carried out a great many high-pressure lighting installations; and we give a photograph of some of their lamps in Birmingham, which is one of the places where the "Pharos-Welsbach" system is to be seen in use. Those who are wishful to have a demonstration of this lighting can, however, do so on the Company's premises at King's Cross, where there is a compressor in position supplying a series of the lamps. As to the "Welsbach Bryan-Donkin" compressor used, this has recently had improvements introduced in connection with the lubricating arrangements and facilities for creating a pressure-wave for lighting and extinguishing public lamps. The lamps themselves are in various sizes; and the outdoor patterns (many patterns for indoor lighting being also supplied) are particularly attractive finished in French grey. Some of the lamps, more especially suitable for shop lighting, are fitted with a really ingenious form of cock—the Welsbach patent automatic lighter and governed flashing bye-pass cock combined. This, in other words, is a cock that can be used either as an automatic distance lighter or as a governed flashing bye-pass cock. A feature of this cock is the total extinction of the bye-pass flame while the lamp is alight. Altogether, it is a useful contrivance.

This account of what was gathered during a brief visit to the Company's headquarters may be fittingly concluded with a word or two on the Kern radiators, new models of which are being prepared for the coming winter's use. The bodies are in chaste designs; but the principal improvements are in the arrangement of the tubes and the burner. The old style of long burner extending from each side of the stove (in the larger sizes) was found to be somewhat in the way; and so the burner has been, as it were, doubled-up, in the manner indicated by the accompanying illustration—projecting only from one side of the stove, instead of from both. At the same time, the length of the fire front itself has been much shortened, by fitting two rows of smaller heating-tubes, instead of having them all in one row as was formerly the case. For instance, where there used to be ten tubes in one row, there will now be a row of six tubes in front, and another row of five tubes at the back of them. In the older form, there were two controls provided, one for one-half of the tubes and another for the other; and this arrangement has been maintained in the new models. The air and gas adjusters are connected, so that both may be operated by one movement.

NORTH BRITISH ASSOCIATION MEETING IN GREENOCK.

The General Proceedings.

THE Fifty-Second Annual Meeting of the North British Association of Gas Managers was held in the James Watt Museum Hall, Greenock, last Thursday; the members who attended numbering ninety. The deliberations were carried on under the chairmanship of Mr. JAMES MACLEOD, of Greenock, the President.

MR. JAMES MACLEOD, this year's President, gave (as was expected) an admirable presidential address. He apologized, needlessly, for lack of time to do more than describe the history and the development of the works he is in charge of; and when works have been so much enlarged and altered as those at Greenock, there is surely no better subject for an address than one with which the author is so intimately connected. He can explain his reasons for adopting each piece of apparatus; give his expectations, and possibly his experience, of each; and when these are given by a man of Mr. Macleod's experience and knowledge, they are of immense value to all connected with the gas profession. His description of the sulphate and other ammonia plants was very full, and the details of the laying of the high-pressure main, with lead-wool and welded joints, will be of help to others with similar work to do. The installation of vertical retorts on the Woodall-Duckham system, and a gasholder of one million cubic feet capacity, were mentioned as in hand; and, with reference to the latter, the President deprecated the reduction of the gasholder capacity below the old twenty-four hours rule. In this he differs from the majority of gas engineers, who hold that, now so much gas is used during the day, a less capacity will suffice.

Mr. Halkett's paper showed that he thoroughly realizes the work required from a distributing engineer, and he detailed this work in full, so that anyone desiring to obtain such a post will know at once if he has the necessary qualifications; and directors or councillors in charge of gas-works will now know what qualifications to demand. As regards the training of the gas-fitter, much has already been said; but Mr. Halkett appears to press too much upon the need for practical training, and to leave on one side the question of the knowledge of first principles. Boys of the rank from which gas-fitters come are not taught science; and without the elementary scientific facts governing the supply of gas, they will never intelligently put their practical knowledge to proper use. Many men throughout the gas profession are prone to look upon science as opposed to practice, and to consider that practical experience is all that is required. This is far from the case, as no man can afford to ignore the technical knowledge of his subject, whatever that subject may be. How many fitters know why clothes dry, why smoke ascends, why the air of a room sometimes feels dry, or why light diminishes as the square of the distance? How can such men properly diagnose a fault in a gas-stove-fitted room, or fix upon the size of the necessary light for a given space, unless they do understand these facts. In giving instruction to such men, scientific facts must be instilled with the practical use to which these facts can be put.

Mr. Scott's paper was, as Mr. Shadbolt remarked, an admirably simple explanation of the allowances and disallowances for depreciation by the Inland Revenue Commissioners under the older Finance Act of 1878, and the more recent arrangement come to between representatives of the principal gas companies and the Inland Revenue. There has been so much difference in the past between town and town, owing to each set of Commissioners having its own system which it was not thought fit to divulge, that any plan which lays down a fixed rule is in itself a good thing. But when, as in the instance cited by Mr. Scott, this also represents a saving to the company, it behoves all gas managers to examine their accounts, and see if they cannot also obtain this benefit for their undertakings. For this purpose, the clear exposition of Mr. Scott will be a great aid, especially where the manager has not had a large experience in rating matters. Associations could well do with more of these instructive papers.

Mr. Vass detailed the "Perth" system of "free" domestic gas apparatus, which provides for a minimum gas consumption, which if not reached entails a payment on the part of the consumer. Perhaps "entails" is hardly the right word, as, from remarks made by Mr. Vass after the discussion, he appears not to have called for any of the guarantees under the agreement between consumers and the Council. The arrangement is no doubt a fair one as regards the supplier; but from the point of view of the consumer who makes good use of any of these appliances, and uses considerably more than the amount laid down, it is hardly so fair, as he is then paying more than the 10 per cent. referred to by Mr. Vass. The plan proposed, however, prevents the taking by the consumer of a gas-stove or other appliance of which he only intends to make but little use, and which under the free policy he could freely do. The figures given by Mr. Vass will require careful examination and revision before they will suit all localities.

Many, no doubt, were disappointed at not hearing more from Dr. Davidson regarding liquid purification; but his lecture, which he gave as the "William Young Memorial Lecture," was so full on other matters of importance in the manufacture of gas, that the part referring to the liquid purification was squeezed out. Dr. Davidson referred to many points which will make his hearers and those who read his lecture, think carefully out, so as to see if they, too, cannot realize some of the economies he referred to. If he had only shown the flap-valve invented by Mr. Brooke, of the Nechells Works, Birmingham, and if this simple invention gives anything like the excellent results mentioned when in use at other works, then the lecture would be good value for this information alone. But beyond this there are many facts and figures which may form the basis of a comparison between what is done in the works Dr. Davidson is in charge of and others. In this connection, it may be wondered if managers of small and medium-sized works ever calculate their expenditure and sales on the basis of pence per ton of coal or per 1000 cubic feet of gas made or sold. There is nothing so illuminating or so instructive, and a comparison with similar figures of other works of the same or larger size would at once show where economies might be effected. It is in this way that a consulting engineer commences his examination of the working of any company he is called in to report upon; and the same work might easily be done by the gas manager who is anxious to do the best for his employers.

Bailie SMITH welcomed the members, in the absence of Provost W. B. MacMillan and Bailie J. H. Taylor, the Convener of the Gas Committee. Bailie Smith said that, when the Greenock Corporation were informed that the Association intended to hold their annual Conference in Greenock, they at once decided to offer the hospitality of the town. They had a very pleasant custom in Greenock. When any foreign warships or any of our own battleships came in at the Tail of the Bank, they offered the "facilities of the Port." This was what they intended to offer the Association. He trusted it would not be the fault of the Corporation if the members had not a happy time during their visit. Provost MacMillan was out of town, as was also Bailie Taylor. He was well supported, however, by Dean of Guild Paterson, who was Vice-

Convener of the Gas Committee, and who, by his knowledge, was almost qualified to become a member of the Association. When he mentioned that Mr. Paterson had a knowledge of gas matters, he did not mean that they allowed him to manage the gas-works. They paid a manager to do so. He hoped the results of their deliberations would benefit not only the towns represented there, but all towns. The Greenock Corporation were very gratified to know that their officials were taking a front position in the profession in which they were interested; and they were specially gratified to know that Mr. James Macleod had been thought worthy to be President of the Association. During the short time Mr. Macleod had been with them in Greenock, he had shown what metal was in him; and they anticipated great things in the future from his services. During the meeting under the presidency of Mr. Macleod he hoped the Association would enjoy every success and prosperity.

Report of the Council.

The Secretary and Treasurer (Mr. Lawrence Hislop, of Uddingston) submitted the annual report of the Council, together with the accounts for the year ended the 30th of June; and, on the motion of Mr. W. Blair, of Helensburgh, they were adopted. In the course of the report the Council said:

Membership.

The membership of the Association at June 30, 1913, was 251, compared with 253 at the close of the previous year—a decrease of two. The membership is made up as follows:

Ordinary members	157
Associate members	12
Extraordinary members	75
Honorary members	7
	251

The Council regret that the following members have ceased, by resignation or otherwise, to be connected with the Association:—

Ordinary Members.—Robert L. Deans, Johnstone, deceased; James Lauder, Bridge of Weir, deceased; James M'Laren, Duns, deceased; W. J. Smith, Bolton, in arrears; James Black, North Berwick, resigned; John Bruce, Moffat, resigned; William Taylor, Forres, resigned; M. D. Campbell, Stewarton, resigned; Alex. Walker, Irvine, resigned.

Extraordinary Members.—James Goldie, Glasgow, deceased; Sir John Wilson, Glasgow, resigned.

New Members.

In accordance with the rules, the Council desire to recommend the following gentlemen for membership:—

Ordinary Members.—Lewis Bain, Gas-Works, Cullen; W. Harper, Gas-Works, Forfar; Cuthbert Hamilton, Gas-Works, Loanhead, Midlothian; W. C. Spence, Gas-Works, West Wemyss, Fife; Angus Cunningham, Gas-Works, Bridge of Weir; Gilbert Cummings, Gas-Works, Ballymena (Ireland); Ralph Halkett, Commercial Superintendent, Glasgow Corporation.

Extraordinary Members.—John Barker, of Henry Balfour and Co., Leven, Fife; Thomas B. Penman, of D. A. Penman and Co., Glasgow; George R. Nelson, of D. M. Nelson and Co., Glasgow; James P. Whimster, Coal Merchant, Glasgow.

Institution of Gas Engineers' Delegate.

Mr. David Vass, of Perth, has been appointed to represent the North British Association on the Council of the Institution of Gas Engineers for the year 1913-14.

Commercial Sections.

Western District.—During the past year, this section has had most interesting monthly meetings, presided over by Mr. James Macleod, of Greenock, who was again unanimously elected Chairman for the ensuing year. The total membership is now 35—an increase of three over the previous year. The monthly meetings held at different gas-works which are under management of members was greatly enjoyed and well patronized by members. The questions raised for discussion embraced manufacture of gas (vertical retorts, &c.), distribution of gas, residuals market, &c.; a very free interchange of opinions and information being given by the members. It is pleasing to note that a larger number of members are sending in their monthly returns than in former years. Financially, the Western Section is in a healthy condition; the balance in hand at the end of year being £23 2s. 5d.

On behalf of the Committee,
(Signed) Peter B. Watson, Secretary and Treasurer.

North-Eastern District.—I have pleasure in reporting on the North-Eastern District Commercial Section for the past year. The membership stands practically the same as the previous year—viz., 31. Five meetings have been held during the year at the following centres: Edinburgh, Dundee, Alloa, Perth, and Brechin. At Edinburgh, a joint meeting of the North-Eastern and Western Sections was held. All meetings were well attended, and the interest of the members has been sustained throughout. Besides the usual matter for discussion, the following subjects came under review: Tenants' Capital; Question of Corporations, &c., Subscribing to Publicity Schemes; as also many other points of general commercial interest.

On behalf of the Committee,
(Signed) R. S. Johnston, Secretary.

Benevolent Fund.

During the financial year ended June 30, 1913, two applications for assistance from this fund were received, and, after careful inquiry by the Council, donations were granted. The amount at the credit of this fund is now £593 7s. 2d., of which £586 4s. 9d. has been invested in North British Railway Company 3 per cent. debenture stock, at a price which yields nearly 4 per cent. of interest annually.

Accounts.

The statement of accounts and balance-sheet for the year ended June 30, 1913, duly audited by Mr. David Spalding, F.S.A.A.—appended to the report—show that the affairs of the Association are in a sound financial condition. [On the general fund, the cash in the bank is £83.]

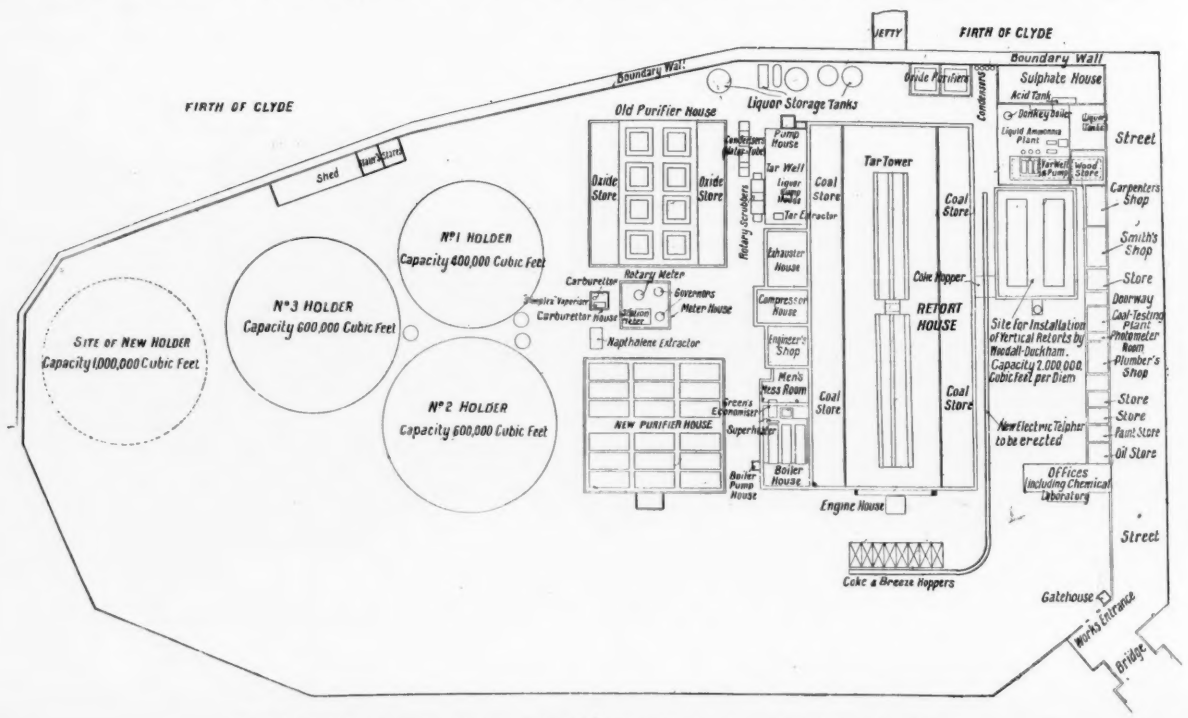
Murdoch Memorial.

In accordance with the remit to the Council from the last annual general meeting at Aberdeen, a memorial tablet has now been erected on the front of the house at Bello Mill, near Lugar, Ayrshire, the birthplace of William Murdoch, the inventor of gas lighting. The artist for the tablet was Mr. H. S. Gamley, A.R.S.A., of Edinburgh, and it was duly unveiled on Saturday, July 26, by Mr. George R. Hislop, of Paisley, in the presence of a large and distinguished company of gas engineers and others connected with the gas industry.

The President then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—Since the writer came to Greenock, so little time has been left to him for continued thought on any one single aspect of gas manufacture, and his energies have been so disseminated over the many requirements of the works, that he at



BLOCK PLAN OF THE GREENOCK CORPORATION (INCHGREEN) GAS-WORKS.

once decided, on thinking over the question of an address, that a simple record of what had been done would form possibly the best subject he could place before you, and would assuredly be the subject of surest personal knowledge.

GREENOCK'S FIRST GAS SUPPLY.

A gas supply was first available in Greenock about Sept. 1, 1828; several public-spirited citizens having guaranteed the necessary capital to erect and equip the works. These works were at the start under the control of the Trustees of the Water Fund, in whom the right to light the town was vested; but in 1831 they were transferred to the Magistrates and Council of Greenock. In the first year, the number of consumers was 89 by meter and 433 by contract, and by 1840 the numbers were 649 and 992 respectively. The number of contract consumers then rapidly declined till in 1850 they had practically ceased, and the consumers by meter had increased to 4756. The number of consumers at June 30, 1913, was 16,201.

The continued growth of the town rendered it imperative that a new site should be secured in order to build works on a scale suited to its requirements. This site was found on the island of Inchgreen, at the extreme east end of the town; and in 1873 the new works designed by the late Mr. Samuel Stewart were set in operation. These works were greatly admired when first completed; but the continued growth of output has had its usual effect of causing additional plant to be put down, thereby obscuring to some extent the original design. Further advancing output within the last four years rendered additions necessary; and the financial position of the Gas Department was remarkably favourable for dealing with extensions. This will be fully realized when it is stated that at June 30, 1913, the interest-bearing debt of the department was a little over £200 per million feet sold and accounted for. This is the lowest in Scotland known to the writer—indeed, five times that debt is not unknown.

SULPHATE PLANT RECONSTRUCTION.

The first step in the way of reconstruction dealt with was the sulphate plant, which had reached a dangerous state, due to the action of the sulphuric acid on the building—both mortar and bricks being effected. The plant was, moreover, somewhat small; being only of 30 cwt. per day capacity. It was decided to erect a new plant of the capacity of 3 tons per twenty-four hours. The successful offerers were Messrs. C. & W. Walker. The plant, including all buildings and purifiers, but excluding condensers, which were in fair condition and were again utilized, cost £1535. The saturator, which is of the open type, is on the upper floor level.

The salt is ejected from the saturator direct into the 48-inch centrifugal; the latter being placed at such a height that the hot drainings discharge straight into the saturator and very little loss of heat occurs. The dry salt is discharged into a travelling tilting bucket carried on an overhead rail fitted with Herbert Morris's travelling gear, and is carried to the store. Railway trucks can be brought alongside the end of the store, and the bags of sulphate discharged down a shoot into them. This overhead arrangement minimizes labour; and there is no valid reason for bringing ammonia gas from the top of the still down to the saturator on the ground level when, by keeping the saturator up, the loading of trucks is so much facilitated.

The direct discharge from the saturator to the centrifugal was not arrived at right away, as at first the salt was delivered on to a draining table and raked into the centrifugal. This method proved cumbersome, and so the direct discharge was resorted to. The centrifugal, although not of the centrally-hung type now so popular, has given every satisfaction. The usual deep seal pot arrangement for the discharge of the spent liquor not proving absolutely satisfactory, a Wilton's patent discharge valve was adopted; and this has worked admirably.

A local chemical manufacturing firm having applied to see if they could not be supplied with liquid ammonia, this matter was placed before the Corporation; and it was decided that a liquid ammonia plant should be installed. Messrs. Wilton received the contract. The total cost of the plant and foundation, &c., was £1000 approximately (existing buildings being utilized), and it is capable of producing 10 tons of ·900 liquid ammonia per week of sixty hours. The plant consists of two main stills—one with a worm on top for heating liquor, the other with a condenser on top for cooling out moisture from the ammonia gas—and two scrubbing towers, one containing caustic soda, the other oil.

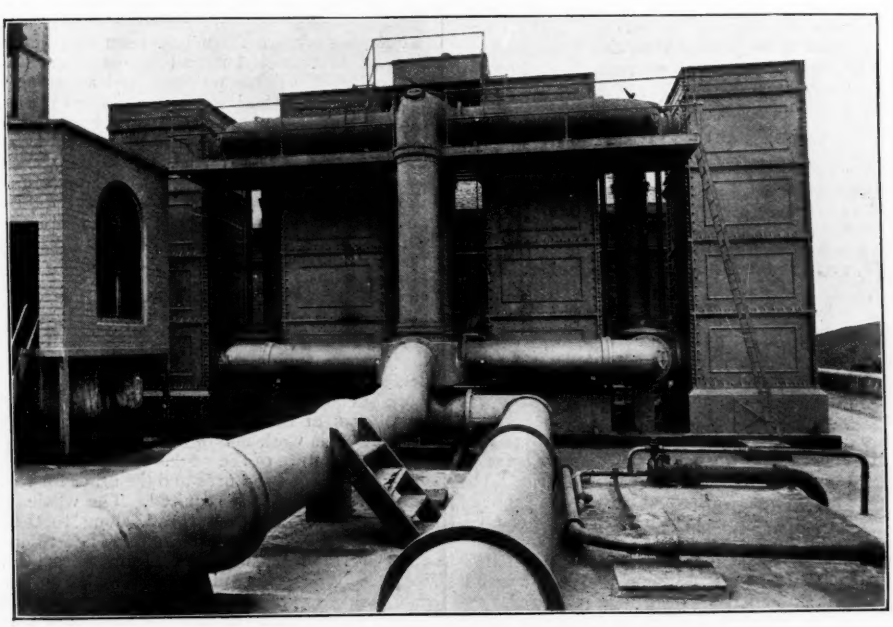
The existing sulphate plant is utilized to a considerable extent. The ammoniacal liquor flows from the meter through a heating coil placed above the first still of the new plant into the fixed still of the existing sulphate plant; thence it is pumped into the existing liming vessel, and then passes through into the first new still. It is there boiled-up with steam, and the ammonia coming off at the top descends to the bottom of still No. 2, superimposed on which is a water-cooled condenser. Thence the gas travels to the soda washer, where the last traces of hydrogen sulphide are removed. It finally passes to the oil-washer, where pyridine is removed, and then into the absorption tanks filled with water and cooled by a water spray when necessary.

This plant has been in use too short a time to say exactly what return it will give; but it is expected to produce 10 per cent. on the capital involved. It requires more skilled attention than the sulphate plant, and takes more lime, steam, oil, caustic soda, and water. On the other hand, no sulphuric acid is required, and the filling is done with a minimum of cost—there being no breaking, bagging, and filling as with sulphate, and there are no lead repairs. Great care has to be exercised in making the plant tight, as losses are likely to be more serious than with the sulphate plant.

The waste gases from the first boiling are returned to the saturator, so that a small proportion of sulphate is made. While this saturator was off for repairs, the waste gases containing ammonia were returned to the foul main in the retort-house. The 2-inch pipe carrying the gases gave some trouble through filling up with ammonium bicarbonate containing a little sulphocyanide and sulphide; but a steam-valve was fitted, which is turned on for half-an-hour every twenty-four hours, and this prevented further choking—the decomposition temperature of ammonium bicarbonate being easily reached. The writer watched carefully to see if the return of the gases from the still into the foul main would alter the amount of carbonic acid in the town gas; but no appreciable difference was observed.

CONDENSING PLANT.

The works condensing plant, which was of the annular type, had got into a rather dilapidated state, although its outer appearance was not bad. Owing to faulty construction at the top and bottom, it was very difficult for a man to gain access to the outer side of the inner tubes for painting purposes. So this had been neglected, with the result that corrosion had gone on very extensively. It was decided that the condensers should be replaced by a set of the reversible water-cooled type; and Messrs. Clapham Bros. were the successful offerers. A tar-extractor and Livesey washer were included in the contract; the cost being £2495. The set

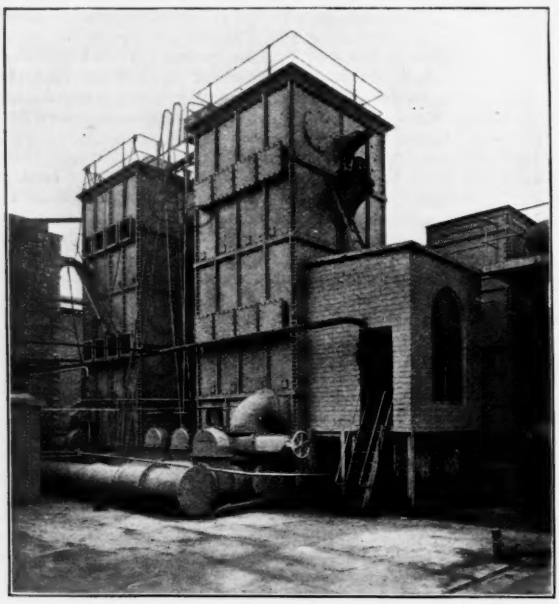


REVERSIBLE WATER-COOLED CONDENSERS.

consists of four towers, each of a nominal capacity of 1,000,000 cubic feet per twenty-four hours, and the gas can go through the series 1 to 4 or 4 to 1, or 1, 2, or 3 towers can be used as required. The cooling water can likewise be reversed. There are 342 tubes 1¾ inches external diameter in each tower, and not a single leak has been experienced. The only difficulty—and a minor one at that—was that some months ago the seal-pots got choked up with small crystals of ammonium bicarbonate.

Some ammonia finding its way past the scrubber, which was of the Holmes vertical brush type, it was decided that a second scrubber should be installed; and another of the same type, and by the same makers, was finally selected. The cost of this, with valves, &c., complete, was £1358. It is of 3 million cubic feet per twenty-four hours nominal capacity.

The two scrubbers can now be worked in series, and the benefit of removing sulphuretted hydrogen and carbonic acid by washing the gas with strong liquor obtained. It is, as is well known, no easy matter to reduce ammonia beyond certain limits; but it pays to perform this extraction as thoroughly as possible.



Vertical Brush Scrubbers, and Engine House.

There is but little fear of reducing the ammonia to such an extent here that the benefit of having the oxide of iron used for purification slightly alkaline is lost. Out of a dozen samples of oxide tested, it was found that most of them gave an alkaline or neutral reaction on lixiviation with water and testing the resulting solution. Indeed, even at the waste-gas purifiers of the sulphate plant the oxide only shows acid after very considerable use—proving that traces of ammonia even escape the saturator. The greater concentration of the liquor is another advantage of having the scrubbers of ample size and worked in series; and a further advantage is that one is capable of doing all the work for a great part of the year, or any portion of the year, if required, but, of course, not so completely with so elusive a body as ammonia. The two separate scrubbers are a distinct advantage just as surely as two separate washers for naphthalene are a distinct advantage.

TAR-EXTRACTOR.

The tar-extractor supplied with the condenser contract has proved very advantageous in keeping the scrubbers and also the purifiers free from tar. It is generally worked at from 1½ inches to 2 inches back-pressure. It required no cleaning for two years—possibly because it is in a sheltered corner and close to the exhauster, and the gas, even in winter, practically never enters below 60° Fahr.

LIVESEY WASHER.

The naphthalene washer is of the Livesey type, and various oils have been tried in it for diminishing the naphthalene content of the gas. One of the first was a heavy naphtha from one of the Scottish shale oil companies, another from the same company was a lighter paraffin of about ·750 sp. gr., another a coal-tar product, and yet another was a mixture of a light and heavy coal-tar product. It was found when using the naphthas that no trace of naphthalene dissolved in the oil remaining in the washer could be detected, and that the action must consequently be solely that of the oil vaporizing with the gas and condensing in the syphon pots. The finding that the oil in the washer was practically free from naphthalene was somewhat unexpected. Samples of the oil after much gas had passed were drawn off and immersed in a freezing mixture. But no separation of naphthalene took place; and experiments with pure naphthalene dissolved in the oil gave a bulky precipitate on freezing.

Test of the oil obtained from the tar-works, which was largely a carbolic acid or middle fraction, showed an action somewhat different. This oil as it was first received contained some naphthalene. After using for a time in the washer, the naphthalene content had risen, showing that it was being absorbed in the washer. The action is a dual one. The oil is thrown into a fine spray and partly carried on, to fall out in the nearest syphon pot, together with naphthalene from the gas; and naphthalene is also left in solution in the washer. This Livesey washer is placed between the purifiers and the station meter. Trouble with crusts of naphthalene in the water overflow of the station meter, which at one time were of frequent occurrence, at once disappeared with the installation of the washer. Further to the above, a "Simplex" vaporizer is installed; Russian petroleum or vaporizing oil being used in it. This oil is of ·822 sp. gr.

The inlet gas from the 24-inch main to the town is taken through a 4-inch connection from the inlet side of the station governor, and the 4-inch outlet is connected to the town main beyond the governor. The necessary difference of pressure to ensure the passage of the gas from the inlet to the outlet of the vaporizer is thus obtained. The oil has been used so far at the rate of 2·64 gallons per million cubic feet sent out. This seems very little; yet the oil has been found condensed out in the main quite a long way from the works. The naphthalene stoppages have decreased this year, as compared with last year, to less than one-half, which is not unsatisfactory. When the interior of the main gets a thin film of oil over the whole length, I hope this trouble may practically cease, as will also the trouble from internal corrosion. Of course, if vertical retorts are installed, this matter will not require such precautions to deal with it, as, no matter what system of verticals be adopted, the naphthalene content of the gas seems to be exceedingly low, and it may be dealt with by careful condensation alone without oil washing or the vaporizing of an oil into the gas. This means yet another small saving in favour of the new system.

STATION GOVERNOR TROUBLES.

A flaw having developed in the bell of the station governor, considerable trouble was experienced in effecting a repair. This led to the installation of a second governor, somewhat similar in type, by the same makers—Messrs. Peebles. Provision had been made when the works were built, forty odd years ago, for a second governor, as flanged tees were left in the inlet and outlet mains to take a governor. It proved, however, that these flanges were not opposite each other, and were not parallel. This necessitated a somewhat difficult casting for the closing piece. The tee being very short, the bag shutting off the gas could not get a satisfactory bearing surface; and, consequently, the work of making a pattern for the special casting was one of considerable difficulty, as it had to be fitted in position with some gas blowing all the time. The work was, however, successfully carried out by a local firm; and the casting, when made, fitted like a glove. The 4-inch hole taking the bag was drilled and tapped with Pass's under-pressure drilling apparatus. There was not room enough to use a Goodman stopper. Inserting two bags and bridging was not convenient.

STATION METERS.

A Thorpe and Marsh rotary station meter was installed at the same time as the governor. The principal station meter is of 100,000 cubic feet per hour capacity. It is of the rectangular type, and was built by Messrs. Laidlaw. There is a very striking contrast between the space occupied by the latter and by the rotary meter of 150,000 cubic feet per hour capacity. The last-named has worked quite successfully.

PURIFIERS.

For many years there had been talk of new purifiers. Mr. Stewart first mooted it, and his successor (Mr. Ewing) strongly advocated it. These purifiers had all along been the weakest spot in an otherwise beautifully designed works. All the connections were in deep passage-ways between the boxes, and liable to be submerged by any high tide—indeed, they have been under water on three or four occasions in the writer's time. Possibly on account of the feeling that something was going to be done in the way of installing new purifiers, much too little had been spent for years back on repairs on the old purifiers. The covers had got into a really dangerous state, and were very much patched. It was decided in 1906 that two new boxes should be erected; and this was done.

The boxes are on the overhead principle, and are 40 ft. by 30 ft. by 6 ft. deep, with dry lutes. The covers on the old boxes were always getting worse, and the author asked for four more boxes of the same capacity as the two new ones installed by his predecessor. Sanction was given for this; and in January, 1910, the work of extending the new purifier-house and putting in the four new boxes of the same size—viz., 40 ft. by 30 ft. by 6 ft. was begun. This work is now completed. The accompanying photo shows the nature of the work. The boxes are operated by Weck valves—one for two boxes and the other for four. The gas could pass through all six if required. The whole of the 24-inch connections are carried overhead, slung to the horizontal beams carrying the boxes. There are three lids to each box. The two outer lids are fitted with dial thermometers and test-cocks; and there are two relief-valves to each box. There are three discharge doors to each box; and a Spencer patent discharge grid is placed over each door. The gas enters at the top and leaves at the bottom. The two existing boxes had only two discharge doors;

Purifiers on Raised Floor, with Revivifying Floors above and below.

and this was not altered. Spencer patent "Hurdle" grids are used throughout.

There is one hydraulic carriage for dealing with the lids. It is carried on rails, and can be pulled from one side of the house to the other by means of wall winches. This hydraulic carriage is carried from one set of rails to the other by means of Herbert Morris's travelling gear mounted on an overhead beam bolted to the cross joists of the upper floor. The oxide is elevated to the upper floor by means of an elevator which was lying unused in the coal-store, and which was taken down and re-erected. The oxide is delivered from the upper floor through shoots into the boxes below. There are three shoots to each box for filling purposes. The covers are fitted with Clapham's rubber jointing and eccentric fasteners.

Provision is made for warming by means of steam-pipes in the event of severely cold weather. A battery of gauges is provided with inlet and outlet connections from each of the six boxes, and also a main inlet and main outlet gauge. To minimize the loss of gas when a cover is lifted, a connection is made from each box to the exhauster; and when opening a box a valve on this connection is opened, and a gauge is watched till about level gauge is shown, when the valve is closed and the purifier cover removed. The rotation of the boxes has been the ordinary direct method so far. Skelton or broad flanged beams are largely used throughout.

REBUILDING AN OLD BENCH.

To keep the work going until verticals could be installed, an old Klönne bench, containing forty-eight retorts, had to be rebuilt. The successful Contractors were Messrs. Robert Dempster & Sons, of Elland, who carried out the work on Brookes's system. A Parkinson and Cowan retort-house governor was included in the contract, and also a tar-tower. These call for no comment, beyond saying that the tar-tower requires careful watching to keep the tar moving when the weather is cold.

ROTARY EXHAUSTER.

The stand-by exhauster to the Laidlaw rotary exhauster, which was kept going the whole year with generally but a fortnight's break, being of the old upright plunger pattern, estimates were asked for a rotary exhauster of 150,000 cubic feet per hour capacity. Messrs. Bryan Donkin secured the contract; the price being £636, exclusive of the buildings. The exhauster and engine are provided with all accessories of the latest and best type. The lubrication is done by means of the Vacuum Oil Company's automatic lubricators.

EXTENSIONS TO BUILDINGS.

The building containing the exhausting plant required considerable extension. The pipes and connections were submerged in mud and water. This had to be cleared away and the bottom concreted, with a slope towards a new drain; and this should keep it dry, except at very high tides. The roof was in a very bad state, as was also the roof of the engineer's shop. The wall heads in both these buildings were above the apex of the roofs, and carried heavy and expensive stone copings. The question was how to put the roofs right without interfering with the pleasing architectural design and without interfering with the exhauster or the work going on in the mechanics' shop. It was decided to carry steel beams from wall head to wall head, and on them to lay reinforced concrete. This was done; and the slated roofs were removed from below. As will be seen from the photos practically no difference in the appearance of the buildings is made. The meter-house was treated in a similar manner as to the clearing out and concreting and roofing; the walls being tiled from top to bottom. The practical avoidance of future upkeep was a great inducement for tiling.

The removal of the old roofs gave 6 feet extra headroom in each building. Advantage was taken of these alterations to go in for a men's mess room; but this calls for no comment, beyond saying that the lavatory portion is tiled from floor to ceiling, on sanitary grounds.

The existing boiler-house having room for a third boiler similar to the two 30 ft. by 8 ft. boilers already existing, and as it requires two boilers steaming hard to keep the work going, tenders were asked for a third boiler to act as a stand-by. The successful Contractors were Messrs. Marshall, of Motherwell. Opportunity was taken at the same time to instal a Green's economizer in the main flue. The cold water is pumped by a weir pump from a small storage tank fed from the town's supply. The water then passes up through a Holden and Brookes' feed-water heater, and from this to the Green's economizer. From the economizer (which it leaves at about 280° Fahr.), it is fed into the boiler, passing through a Hamilton-M'Master internal feed heater. The steam passes through a Ferguson superheater, and then goes on to mix with the saturated steam from the other boiler. This obviates wet steam at distant points.

DISTRIBUTION.

The growth of consumption in certain districts of the town led to others being short of supply at certain hours. Fortunately, the 24-inch main leading to the town has very few connections taken from it until it reaches the centre of the town, as the pressure at the works during the time of maximum demand has to be kept up to 60-10ths. To deal with the districts where insufficient pressure obtained, it was decided to lay an 8-inch steel main from the works to the extreme end of the district, and return the gas through a Johnson-Reynolds' governor into the existing mains there. An 8-inch main was decided on; so that during the week-ends and holiday times ordinary gasholder pressure would be sufficient to reinforce the defective pressure areas without using the compressors. The Mannesmann Tube Company secured the contract for the steel tubes, and Messrs. Brown and Young, of Glasgow, the laying. The tubes are rigid jointed, with an average length of more than 30 feet. The gauge of the tubes is of 5 to 6 B.W.G.; the tubes being wrapped and coated. The so-called rigid joint, however, is not truly rigid; there is a certain amount of play in it.

The jointing was done mainly with lead wool; the jointers being supplied by the Lead Wool Company. The writer found the most satisfactory procedure to be as follows: About 2 inches of the spigot was smeared carefully with Dixon's graphite compound, and the inside of the faucet was also wiped with it; then the pipe was driven home, and a strand of oakum driven in and staved. Then two strands of rope yarn were likewise driven in and staved—the latter helping to keep any oily matter off the lead wool. Then eight skeins of lead wool were driven in and caulked carefully. The main was tested as it proceeded; a pipe being led into it from the air-compressor which drives the drawing and charging machinery at the works. Where the air-pipe was led in through a flange, a pressure-gauge was also fitted; a Milne leakage indicator being used at the far-end. The joints were thus tested at 50 lbs. air pressure throughout. It is remarkably difficult to get valves to stand 50 lbs. air pressure—even those with gun-metal faces, specially hand scraped to withstand high-pressure gas, not showing dead-tight at 50 lbs. air, although possibly good enough for practical high distribution pressures of (say) 8 to 9 lbs. gas pressure. It may be that particles of dust or rust from the interior surfaces of the main are blown into the valves and prevent close contact of the faces.

OXY-ACETYLENE PIPE WELDING.

The pioneer work of Mr. George Helps has been closely followed by the writer; and this largely influenced him in deciding to weld the last three-quarters of a mile of the main—the total length being almost five miles. The oxy-acetylene outfit was purchased from the British Oxygen Company, who also supplied a man for a day or two for demonstration purposes. Only one joint was made with the faucet ring remaining on the pipes. In all the rest the faucets were first of all cut off with the oxy-acetylene blow-pipe before starting to make the joint. Extra lengths required were supplied ready for welding; and these were much more easily welded. The welding is by no means an easy job. It demands very considerable care; and the joints which must of necessity be done in the trench offer extra difficulty. The man must literally keep the molten metal supported by the flame while working underneath, where the metal has every tendency to run away from the joint. In a large town, or in any town where the roadways contain many pipes, welding in the trench must necessarily be resorted to; and there are not a few places where, on account of the congested nature of the ground with all sorts of pipes, welding is impossible, and lead wool must be used.

I am convinced, from what welding I have done on this 8-inch main, and also on three-quarters of a mile of 6-inch Stewarts and Lloyds steel main, that welding is ahead of any or every other system of jointing. The cost per joint of welding the 8-inch pipe, not allowing proportionate interest on the cost of the welding plant (which cost £53 complete), was 4s. 1·03d. per joint. This price includes the cutting off of the faucet rings, but does not include the cost of handling the pipes. The cost of the pipe is not yet known, nor the allowance needed for interest on the cost of plant. The 6-inch pipes were supplied ready for welding. When welding

STEEL MAIN SHOWING HINGED COVER TO PREVENT MELTED BITUMEN FALLING ON WORKMAN WHEN WELDING UNDERNEATH.

underneath these wrapped and coated pipes, considerable trouble was experienced from the molten coating material dropping on the hands and arms of the welder, and also penetrating his clothing. This was avoided by putting on a hinged sheet-iron jacket over the pipe, as seen in the photo. Where there was a straight run without crossing pipes, it was possible to weld as many as six lengths of the 8-inch tube above ground and then lower it. This, of course, renders the welding much easier and quicker. The photo shows such a case. As stated, however, this is not often possible in a large town where many pipes exist in the roadways.

COMPRESSOR.

The gas is compressed by Bryan-Donkin reciprocating compressors—a duplicate set being provided. They are gas-driven; the engines also being in duplicate. Provision is made for preventing the pressure in the main rising above the predetermined pressure, which in this case, in the meantime, is about 3½ lbs. One consumer required 8 to 9 lbs. for aluminium melting. The cost of keeping the entire main at this pressure was, however, too great. A separate small compressor has therefore been installed in this consumer's premises.

The writer expects this main to be of great and growing service to his department. Branch pieces, with valves, were placed at intervals on the line of main, so that works or defective supply areas could be supplied with little trouble.

The syphons are fitted with heavy brass packed cocks with screwed coupling; the coupling being protected by a cap fastened by a chain to the body of the cock. When it is required to empty the syphon, a length of armoured hose is attached to the coupling, and the cock is opened, when any liquid contained in the pot is blown out. The fewer syphons there are on a high-pressure main system the better. They are possible sources of leakage, and, except those near to the compressor, are not required, as what is going to condense does so fairly near to the compressor. The welded joints, like all the others, were carefully wrapped with jute cloth impregnated with a boiling mixture of pitch and tar. The main throughout its length was given an additional coating of boiled pitch and tar, and all damage to wrapping made good.

SHOW-ROOMS.

No gas undertaking which desires to be modern and up to date, and is on the outlook for business, is without a show-room in a good thoroughfare of the town. Greenock had for many years a show-room; but being placed in a quiet back street, very few people knew of its existence. The inadequacy of this show-room had long been felt; and as the Department owned a vacant site in the best street in the town, it was ultimately decided that new and considerably larger premises should be built. A passage-way from the old to the new show-room was bought back; and this very much improved the convenience of the arrangement. The show-room occupies a space 80 ft. by 50 ft. by 16 ft. high. Model rooms fitted with suitable gas-consuming apparatus are to be provided, and the six dwelling-houses above the show-room are to be fitted with the most modern gas appliances. It is hoped that a certificated lady cookery expert will be attached to the show-room for the convenience of consumers who are having difficulty with their cookers. Two maintenance men are employed on the staff at the show-room, and pay house-to-house visits and find out if consumers are satisfied. Although only recently appointed, the work done in this way seems valuable.

VERTICAL RETORTS.

Continued growth in output has led to the consideration of the installation of vertical retorts. The increase in the gas sold and accounted for during the last five years (for the year ending June 30 in each case) is as follows:—

1909—292 millions, and practically the same figure for the three previous years.		
1910—300	,,	the writer's first complete year.
1911—317	,,	
1912—361	,,	
1913—383	,,	

These increases amount in all to 31 per cent.; and as already another year shows still further increase, there is reasonable prospects of continued advancement. The other reasons which weighed in deciding upon the necessary considerable expenditure were as follows: As compared with the present method in use, a considerable saving in the coal necessary would be effected. The coke and breeze used for boilers would be very largely reduced, as the heavy steam-driven compressor for the compressed air for the drawing and charging machines would ultimately not be required. The coke used for heating the furnaces would be considerably reduced. The steam-driven hot-coke conveyors would also ultimately not be required, and a further fuel saving at the boilers would be obtained. The naphthalene content of the gas, which averages 7 grains per 100 cubic feet after treatment, would be reduced to less than 1 grain, and stoppages would cease from this cause. Consequent on this, there would be a saving in washing oil, vaporizing oil, and labour clearing stoppages. Increased yield of ammonia is also a factor, as well as slightly increased yield of tar. Little or no water would be required for coke quenching; and this is a heavy item here. The cost of lighting the building will in this case be very much less than in the old house. Finally, there will be considerably lower cost of working—indeed, there is no point, with the sole exception of interest on capital, which does not show in financial favour of the vertical system so far as its installation at these works is concerned.

The system selected is the Woodall-Duckham, and consists of 32 retorts. It is combined with coal-waggon tipping plant, capable of tipping at either end, breakers and elevators, tipping tray conveyors on top, stand-by elevator for coal, coal-bunkers for 48 hours' coal supply, and coke-hoppers for a 30 hours' supply. There is also a telpher track for coke handling, which can feed into the existing coke-hoppers of 150 tons, as well as into a new hopper of 50 tons capacity, and coke screening plant.

The coke is discharged from the bottom of the retort into bogies, which run down a slight incline to underneath the telpher, where they are picked up, and the coke dropped into the screen. The telpher is operated electrically; the power being generated by gas-engines. The plant and equipment have been designed to secure every possible economy so far as could be foreseen.

STORAGE.

The question of storage capacity has also arisen, and it has been decided to erect a lattice standard gasholder, of one million cubic feet capacity, in a steel tank. Bores were put down over the proposed site. The first site tried proved very bad—37 feet on an average before the boulder clay was struck. The second, however, showed a suitable foundation at an average depth of 13 feet; and to this extent the ground will be excavated. The concrete base will be reinforced with expanded metal. The lowest factor of safety will be 4¼; and this is in the lowest ring of tank plates. The soil backing will, of course, be 11 feet up the side of the tank.

There is a tendency emerging here and there to deprecate the

necessity of ample holder capacity in the form of the old idea of twenty-four hours' maximum supply as the capacity to be aimed at; and this tendency the writer cannot help regarding as most reprehensible. The great growth of the use of gas for heating purposes, and the consequent liability to sudden and large demands due to sharp spells of frost, makes this matter of good storage accommodation more urgent now than ever before; and the writer trusts that no additional anxieties and responsibilities may be laid upon the engineer by limiting his storage accommodation. There are already too many places where the gas storage is not at all commensurate with the output, and where, consequently, an excessive demand is made upon the engineer's resources.

There are many other matters of gas policy that one would like very much to touch upon; but already this address is getting too long. The writer trusts that such facts as have been given may be of use to some of his hearers.

At the conclusion of the address,

Mr. David Vass (Perth) said he thought they were all agreed that Mr. Macleod had laid before them something which would repay earnest study. He had brought before them the history of the Greenock gas undertaking. They would see that Greenock had been in the van in the way of municipalizing. Away back in 1831, the undertaking was in the hands of the Magistrates of the town, and even in the beginning it was in the hands of a Public Trust. The work of meeting the enormous increase in the demand for gas was one that Mr. Macleod had set his mind to very firmly. He had tackled the task in no mean-spirited manner, and it would bring its own return in increase of profits and reduced prices. Greenock had been advancing by leaps and bounds. Mr. Macleod was taking an up-to-date view in all his appliances with regard to purification and with reference to freeing the gas from naphthalene, and was preparing for the newest style of carbonizing. He moved a vote of thanks to the President; and it was enthusiastically carried.

The President, in responding, said that in simply describing what he had actually carried through, he had taken the line of least resistance. At a time when he was overburdened with work, he was sure they would appreciate the fact that it would have been almost impossible for him to devote himself to something demanding more original thought.

Papers and Lecture.

The three papers were then read, and the William Young Memorial Lecture was delivered. These will be found on other pages of this issue. After they had been submitted, a discussion was invited on all the matters that had been put forward.

The President, in introducing Dr. Davidson, who delivered the Memorial Lecture, said he stood for everything that was thoughtful and original in gas matters at the present time. He was the outstanding man in research work connected with the gas industry; and they all looked forward to a very great treat.

Election of Office-Bearers.

The ballot for the election of office-bearers resulted as follows:

President.—Mr. David Vass, of Perth.
Vice-President.—Mr. Alex. Bell, of Peebles.
New Members of Council.—Mr. Robert Muir, of Galston, and Mr. William Wilson, of Falkirk.

The Auditors were re-appointed.

Mr. Vass, in returning thanks, said the honour was all the greater and more pleasing to him because the election had been made in Greenock, his native town.

Place of Next Meeting.

In answer to a letter received from the Town Clerk of Perth, stating that, at a meeting of the Town Council, it was decided to extend an invitation to the Association to hold the next annual meeting in that town, the Hon. Secretary (Mr. Lawrence Hislop, of Uddingston) was instructed to write a letter of thanks and acceptance.

Presentation to the President.

Mr. S. Milne (Aberdeen), as the immediate Past-President, said the pleasant duty fell to him to give expression to their indebtedness for the splendid services rendered by their esteemed President, Mr. Macleod. He had much pleasure in handing him as a memento of the occasion the gold badge of the Association.

Mr. Macleod said it had been gratifying to him to carry through such work as fell to his lot.

The Lugar Ceremony.

Mr. Napier said he would move that the Committee be instructed to insert in the proceedings the reports of the Lugar ceremony in memory of William Murdoch, which had appeared in the Technical Journals.

The suggestion was unanimously adopted; and the business proceedings terminated with a vote of thanks to the Secretary for his services.

A Complimentary Dinner.

In the evening the members and their lady friends were entertained at dinner, in the Town Hall, by the Corporation of Greenock. There was a large gathering in the fine large hall; Bailie Smith being in the chair. The loyal toast of "The King and Other Members of the Royal Family" was honoured; and Bailie Smith then proposed the "North British Association of Gas Managers," coupled with the name of Mr. James Macleod, the President. In a witty speech, he spoke of the honour done to Greenock in electing Mr. Macleod as President. They were proud, he said, of their Gas Manager. The undertaking had made tremendous advances under him; and the future was full of promise. It was quite an exception to see ladies in the Town Hall; but he (Bailie Smith) was very pleased to see them there now. He spoke of the vitality of gas which enabled it to compete with electricity, and of the good done to the community by holding the meeting there. Mr. Macleod, in replying for himself and the Association, said how much he owed to the Corporation for the support they gave him. The holding of such meetings as this, when papers were read and ideas exchanged, was indirectly of great benefit to the community. The Association also did good work in perpetuating the memory of the great men of the industry—such as Murdoch and William Young. Mr. Edward Allen, of Liverpool, who was present as a visitor, gave the toast of the "Gas Committee of the Corporation," and Dean of Guild Paterson replied. The toast list concluded with the health of the Chairman, suitably proposed by Mr. R. G. Shadbolt, and acknowledged by Bailie Smith. Songs and recitations filled the gaps between the speeches; and altogether a most enjoyable evening was spent.

The Excursion.

On Friday, an excursion was made by steamer to Arran, *via* Rothesay and the Kyles of Bute—returning *via* Garroch Head. The weather was all that could be desired; the sun shining the whole day. So that, with the foliage looking very fresh and the heather in full bloom, the beautiful Scotch hills were seen at their very best.

Ammonia Losses in Gas-Works.

Referring to this subject last Saturday, the "Chemical Trade Journal" said: "The average manager of a small gas-works is not a chemist, and often does not appreciate the niceties of such a purely chemical process as the absorption and recovery of the ammonia evolved during the distillation of coal. Our contemporary, the 'Journal of Gas Lighting,' is doing good service to the smaller gas undertakings in calling attention to the great waste that may so frequently be found to be taking place at their works. Inefficient washers, leaky store-tanks, and badly worked stills are the chief causes of the waste of ammonia. A glaring example of unscientific management came under our notice a short time ago. The manager of a works which could not be called small discontinued the use of lime in distilling his ammoniacal liquor, because such use prevented him using his old Coffey still, of which he was much enamoured. The consequence was that he was losing at least one-eighth of all his ammonia from this one cause alone; and as this had been going on for many years, the total loss must have run into thousands of pounds. The advent of a new manager, who brought into use a modern still that all this time was standing idle, soon put a different complexion upon the sulphate of ammonia returns. Every ton of coal carbonized in this country should produce 25 or 30 lbs. of sulphate of ammonia; and if due care and attention be paid to the details of the various operations, this production should be realized in practice. There is no excuse for any works, however small, to be satisfied with an output of 14 lbs. per ton of coal."

Visit of Manchester Juniors to Bolton.—We learn from the Hon. Secretary (Mr. James Bridge, of Stretford) that the Council of the Manchester and District Junior Gas Association have made arrangements for the members to visit the Bolton Gas-Works next Saturday, at the invitation of the Chairman and Gas Committee and the Engineer and Manager (Mr. W. J. Smith, B.Sc.). The party will meet at the Lum Street works at three o'clock, and inspect a setting of nine beds of Woodall-Duckham vertical retorts, having a capacity of 2 million cubic feet per diem. They will then proceed to the Gas Street works, where they will see one of West's simultaneous stokers. At six o'clock, Mr. W. Fletcher, of Liverpool, one of the members, will read a paper on "The Construction of Meters."

The New Gas Lighting in Fleet Street.—Under the heading "A Victory for Gas," the London Correspondent of the "Sussex Daily News" wrote as follows last Thursday: "For the time at least the battle for supremacy between gas and electric light has ended in victory for the former, so far as Fleet Street is concerned. The system which has just been installed is that of lamps hung centrally over the roadway on a stout wire, so that there is no obstruction to traffic through standards placed in the road or on the footpath. Several other city thoroughfares are now lighted in a fashion which was common enough in mediæval London or Paris; but the novelty in the case of Fleet Street is the employment of incandescent gas of high illuminating power. It is easy to carry electric current by wires to any point where it may be needed; but, so far as I am aware, gas has never before been used in this way. . . . The new lighting is very effective, for no perceptible shadows are thrown; and the mantles, which are of the inverted type successfully used elsewhere with high-pressure gas, give a strong and steady light over the whole width of the street."

POSSIBLE ECONOMIES IN GAS MANUFACTURE.

By Dr. W. B. Davidson, of Birmingham.

[Second "William Young Memorial Lecture" to the North British Association of Gas Managers. Sept. 4.]

I feel it is a great honour to be asked to deliver this, the second, William Young Memorial Lecture; and I wish I had been able to prepare an address more worthy of the occasion. Probably the subject I have chosen strikes you as commonplace and uninteresting; and it may be said my experience in the gas industry is not sufficient to warrant me speaking with assurance. And yet at a time like the present, when prices of coal and other materials, as well as labour itself, are on the up-grade, with residuals unfortunately on the down-grade, it cannot fail to exercise profitably the minds of all gas engineers to look carefully around with the purpose of ascertaining where even small savings can be effected in the cost of manufacturing town gas. We should be negligent in carrying out our duties as gas engineers were we not in the habit of doing this as a regular thing, and you will agree there is nothing better calculated to bring its own reward as the inauguration of important engineering improvements resulting in a reduction in the price of the necessities of life. Self-complacency or lack of competition usually results in resting on oars and drifting along without making real progress. To take bearings from time to time must therefore serve as a stimulus.

Manufacturing Costs of Coal Gas.

I propose to begin by considering the manufacturing costs of coal gas. As conditions differ in different places, it will be necessary to fix on one manufacturing centre as a point of reference. It will be assumed that modern carbonizing, washing, and purifying plant is used, and that the quality of gas required is 500 B.Th.U. per cubic foot net; the yield per ton of coal being 12,500 cubic feet. As regards prices of coal, coke, tar, liquor, &c., I will take the average of those ruling during the past year or two in the Birmingham district.

Under these conditions, the cost of coal gas leaving the station governors for distribution throughout a town should not exceed 7d. per 1000 cubic feet. Every 1s. on the price of coal will affect this figure to the extent of 1d. If we turn to see how this net cost is arrived at, we get the following table of approximate income and expenditure, which will also serve our purpose in discovering at a glance where it is possible to effect the largest savings. For the sake of convenience, our calculations are made on a basis per ton of coal carbonized. Though there is no pretence to great accuracy in the figures, the estimates are made on actual working experience. Coal and coke are taken at 12s. per ton net. Vertical retort plant is pre-supposed.

Estimated Cost of Coal Gas.

Expenditure.		Pence per Ton of Coal.
Coal and coal handling		148
Carbonizing—		
Wages	7½d.	
Repairs	5	
Power	1½	
Fuel to retorts	23	
Interest and depreciation	20 —	57
Coke removal		3½
Washing		2
Purifying—		
Oxide, wages, and power	3½d.	
Interest and depreciation	6 —	9½
Gasholders and station governors		6
General repairs		6
Maintenance		9½
Salaries		3½
Total		245

Sales.

Coke	96d.
Tar	30
Liquor	30
Sulphur	2
Cyanogen, &c.	2
Total.	160d.

$$\text{Cost per 1000 cubic feet} = \frac{245 - 160}{12{\cdot}5} = 6{\cdot}8\text{d.}$$

The whole complexion of the case is altered when coal goes up and residuals come down in price, or *vice versâ* simultaneously; so that from year to year there are bound to be considerable fluctuations in the net result. Seven pence per 1000 cubic feet may strike many as a very low figure; but it is attained at the present time by works that are not so up-to-date as they might be. I ought to remind you here that in many instances the cheap gas of the present is largely the result of excessive depreciation of manufacturing plant during past years. Though this is no doubt sound financial policy, it sometimes leads to rather erroneous and misleading figures. You will find in some cases, for instance, that retort-houses which are in good working order have been practically written-off in the books, resulting in a reduction in the true price of gas of perhaps 1½d. per 1000 cubic feet. In my estimate, I have endeavoured to be as fair as possible; the most doubtful item being "interest and depreciation"—always a controversial amount.

The works that are thoroughly up-to-date in every respect probably do not exist, and every gas engineer must know of portions of his plant where money has been wasted by lack of intelligence in design. Before discussing methods of cheapening coal gas production, however, I wish to make a few remarks on other possible sources of town gas supply.

Mond Gas.

A Corporation supply of Mond gas under ammonia recovery conditions was seriously suggested in Birmingham a few years ago as a cheap substitute for coal gas or the mixture of 90 per cent. of coal gas and 10 per cent. of carburetted water gas usually sent out to the district. At first sight, the overwhelming superiority of Mond gas in the yield of gaseous heat units and ammonia strikes one very forcibly indeed. Whereas coal gas contains only about 24 per cent., Mond gas usually contains 70 per cent. of the heat energy originally present in the coal. Again, the same coal, yielding 28 lbs. of sulphate of ammonia by distillation, can be made to give 100 lbs. when gasified in a suitably constructed producer under the action of hot-air blast, saturated with steam at 85° C. In coal gas distillation, the great bulk of the heat units and of the nitrogen remain in the coke, a product which disappears on the Mond gas-works. The remarkable flexibility of the producer as regards load also tells in favour of Mond gas. The normal make may be doubled or reduced to one-third on the shortest notice. On the other hand, the capital cost per ton of coal gasified is quite as large for Mond gas as for crude coal gas; there is no income from coke as already stated; and the tar produced is of comparatively little value, owing to its large content (40 per cent.) of water.

Without entering into details, I may say I have reliable authority for estimating the cost of Mond gas produced under recovery conditions at 1½d. per 1000 cubic feet compressed, or ⅞d. uncompressed. This is based on a charge of 10s. per ton of coal yielding from 90 to 100 lbs. of sulphate; the quality of the gas being 140 B.Th.U. net, and the pressure 7 lbs. to the square inch. On this basis of calorific value, coal gas would cost 1·96d., or on a basis of 500 heat units Mond gas would cost 5·36d. compressed, or 3·13d. uncompressed. Having regard to the fact that it would be a practical necessity to supply Mond gas at high pressure, if at all, and that the gas is not quite free from tar, and usually contains from 0·1 to 0·15 per cent. by volume of sulphuretted hydrogen (impurities which can only be removed at considerable expense), the advantage in cost is not very outstanding, and is more than offset by the following disadvantages:—

1.—Though suitable for gas-engines and fairly satisfactory for cooking and heating where only low temperatures are required, it is not of general utility. On account of its low flame-temperature, it cannot be utilized with success for incandescent lighting nor in simple furnaces (without regeneration) for metal melting where the temperatures are 900° C. and over. The flame temperatures are approximately—

Without pre-heating air or gas	900°—1100° C.
With continuous air recuperation	1100°—1200° C.
,, ,, gas and air ,,	1200°—1400° C.
,, reversing gas and air regeneration	1400°—1800° C.

2.—It does not offer anything like the same scope for economy in manufacture as coal gas.

3.—It burns with a non-luminous flame, and is therefore useless with flat-flame burners.

4.—As it has high specific gravity (·80), and contains 60 per cent. of inert gases, the cost of distribution would be higher than with coal gas unless some general arrangement of annual fixed charge per consumer were made.

5.—Though the percentage amount of sulphuretted hydrogen present is comparatively small, it is much more than coal gas if based on the same heating value. Before statutory authority could be obtained for supplying Mond gas in place of town gas, the absence of sulphuretted hydrogen would probably have to be guaranteed. Even now gas-engines working with Mond gas sometimes suffer from the presence of this impurity.

An average composition of recovery gas may be taken as:

CO_2.	O.	CO.	CH_4.	H.	N.
17 ..	*nil* ..	10 ..	3½ ..	26½ ..	43

Water Gas.

Though double the strength of Mond gas, this gas is much weaker than coal gas, not on account of inert constituents, but because its components, carbon monoxide and hydrogen, are of low heating value per unit volume. With coke at anything approaching the price of gas coal, there would be no benefit of any kind attending the use of water gas as a town gas supply. When coke is 12s. per ton, the cost of the purified gas is about 5½d. per 1000 cubic feet; the calorific value being 290 B.Th.U. net. This is equivalent to 9·48d. for a gas having a value of 500 units per cubic foot. Moreover, the high percentage of carbon monoxide

is objectionable. Coke would require to drop in price to less than 6s. per ton before water gas could be produced at the same price as coal gas, quality for quality.

Carburetted Water Gas.

At present prices of gas oil, undertakings which rely partly on carburetted water-gas plant for maintaining their gas output are bound to feel the pinch. Fortunate are those who have sufficient coal-gas plant, however antiquated, to take up the whole demand—that is, provided they have a satisfactory sale for the coke thus liberated.

Assuming the price of coke to be 12s. per ton, the cost of carburetted water gas ready for distribution reduced to a basis of standard quality (500 B.Th.U. per cubic foot in one case and 15 candles in the other) is estimated as follows:—

Oil per Gallon.	Cost per 1000 Cub. Ft. Basis of 500 B.Th.U. Pence.	Cost per 1000 Cub. Ft. Basis of 15 Candles. Pence.
2d.	9·9	6·3
3d.	11·9	8·3
4d.	14·9	10·4
5d.	17·9	12·5

Best actual working at a consumption of 3¾ gallons of oil per 1000 cubic feet, giving a gas of 27-candle power (flat-flame) is here taken as standard.

Even with oil as low as 2d. per gallon, carburetted water gas is considerably dearer than coal gas on a calorific value basis.

Question of Enrichment.

Not infrequently the manufacture of carburetted water gas is resorted to for the purpose of enrichment, as much as for taking up sudden demands on the gas output; and here there is room for economy. The principle is not always realized that, when the enriching agent is considerably more expensive, candle for candle, than the normal coal gas, the richer the enriching agent is, the cheaper will be the resulting mixture—provided, of course, there is no counterbalancing sacrifice in efficiency. It is the displacement of the much cheaper coal gas that makes the use of carburetted water gas so costly at the present time.

Where a certain candle power must be obtained, and the standard is difficult of attainment with unadulterated coal gas, the carburetted water gas, if it must be used, should be of the highest possible grade. It is only the excess in effective candle power over and above that of the coal gas that really counts. Thus, if we have coal gas of 15 candles which has to be enriched to 16 candles, the desired result will be obtained by the mixture of nine parts by volume of coal gas with one part of carburetted water gas of 25 candles; whereas if 20-candle carburetted water gas be used, the mixture requires to be two of the latter to eight of coal gas. The candle power available for enrichment in the one case is 25 − 15 = 10, in the other 20 − 15 = 5. Thus the percentage of carburetted water gas required is halved by increasing the consumption (say) from 3 to 3¾ gallons per 1000 cubic feet (at an efficiency of 6⅔ candles per gallon). In other words, an additional consumption of oil of 25 per cent. increases the enrichment 100 per cent.

It is to be understood that the 20 and 25 candle powers referred to are the true effective ones. Under the conditions that sometimes obtain on gas-works, the effective candle power of the carburetted water gas is much lower than the nominal, both as regards high grade and low grade—that is to say, the actual illuminating power resulting from the admixture of the enriching agent is considerably less than the calculated. This tends to depreciate the value of carburetted water gas as an enriching agent. It is true that high-grade gas suffers rather more in this respect than less rich gas; but the former still remains by far the more economical in practice.

When the retort plant is capable of supplying the proper quality and quantity, undoubtedly the best plan in a case such as the above is to sink all ambitions of manufacturing maximum yield of gas per ton of coal with corresponding reduction in cost. It is much more profitable, when oil is at its present figure, to reduce the make of gas per ton until the necessary quality is attained for town supply. Unfortunately, this is not always possible. Vertical retorts are not noted for their high candle power, nor for great flexibility in the quality of gas, except where steaming arrangements are introduced. Reduction in retort temperature or in the duration of charge is not accompanied by the same increase in candle power and calorific value that one is accustomed to with horizontal retorts.

Where too much has to be sacrified in improving the coal gas itself, one has to choose between carburetted water gas, cannel gas, and benzol for enrichment. If the supply of coal gas is sufficient, and the difference in price of cannel as compared with coal is as great as it is at the present time, benzol, if available, will prove the best investment. Cannel gas has a distinct advantage over carburetted water gas, in that it can without any difficulty be made as rich as 30 to 35 candles. Here, again, the principle comes into play that it is the head or excess that counts. If cannel is used for enrichment, it is very much better to make 10,000 cubic feet of 30-candle gas than 15,000 cubic feet of 20-candle gas per ton, though the gas candle power multiple or sperm value remains the same. In fact, the rich cannel gas, volume for volume, will give three times the enrichment afforded by the poorer cannel gas, assuming that the candle powers stated are the true effective ones. Many a ton of cannel has been wasted through lack of recognition of this elementary arithmetical fact.

Use of Benzol.

With regard to benzol, I am of opinion that it rarely gets fair play, either through want of uniformity in the carburetting or through over-dosing. There would appear to be a good deal of prejudice against its use. Yet it is undoubtedly the most powerful, as well as the most simple and convenient, enriching agent at our disposal. I feel I am here on certain ground. Ordinary good 16-candle coal gas contains 1 per cent. by volume of benzol vapour, equivalent to 3 gallons of liquid benzol in the gas obtained from a ton of coal. The addition of another gallon of benzol in the form of vapour to the 12,000 cubic feet of gas, making the total amount 12,042 cubic feet, will increase the percentage of benzol vapour from 1 to 1·35, and the enrichment will be 1 candle. So long as this addition is not much exceeded, there need be no fear of benzol dropping out, even in very cold weather, as the amount that can be carried, in the absence of other heavy hydrocarbon vapours, is 3 per cent. by volume at freezing-point. The presence of large quantities of heavier vapours, such as those of "Solvene," may have a slightly prejudicial effect—that is, may diminish the active enriching value owing to their liability to condense-out and throw down some of the benzol.

The figures given by different authorities for the enriching value of commercial 90 per cent. benzol vary considerably, owing no doubt to the manner of testing. This is readily understood when one bears in mind that, while very rich gas has the same efficiency in the No. 2 argand burner as in the flat-flame, there is a marked difference between the two burners when the gas possesses low candle power. Thus, a given coal gas may test 16 candles with the No. 2 argand and 10 candles with the flat-flame, and when enriched with benzol the result in both cases may be the same—say, 20 candles. The figure for the enrichment value as obtained with the flat-flame burner may thus be 2½ times that obtained with the No. 2 argand. This fact alone will account for the discrepancies between the enrichment value recognized in Germany and that generally accepted in this country—the figures being respectively 40,000 and 16,000 cubic feet enriched 1 candle by 1 gallon.

When, unfortunately, enrichment is obligatory, the gas manager has to exercise a wise discretion in the choice of enriching agent, if he wishes to avoid waste of money.

Carburetted Water-Gas Tar Emulsion.

Before leaving the subject of auxiliaries to coal gas, I take the opportunity of giving a short account of a method which has proved very successful in dealing with carburetted water-gas tar emulsion, and affords another example of a troublesome waste product converted into a source of revenue. In connection with some water-gas installations, this product gives very serious trouble; other works experience very little annoyance, though the same type of plant and quality of oil are used, and similar general conditions prevail. The bugbear is more noticeable with rich gas than with poor gas. In the works placed under my charge, we had as much as a million gallons of this stuff some twelve months ago, the accumulation of several years' working. Its average composition is as follows:—

	Per Cent. by Volume.
Water	80
Up to 100° C.	8
100° to 130° C.	1½
130° to 370° C.	5
Pitch	5½—100

Even after years of storage, there was little or no separation of tar and water. The great bulk of the emulsion was, and is still, contained in the tank of the relief gasholder. It frequently caused serious trouble by flooding over the holder-tank as the condensation products made-up, and the surplus had to be stored in available tanks and wells. The tar distillers refused to have it, even as a gift; and as it became a menace to the working of the carburetted water-gas plant, energetic steps had to be taken to get rid of it. After a few more or less successful attempts at solving the problem, the following scheme was devised.

The emulsion is pumped from the tank A (fig. 1) by the pump B, through a tube condenser C, then through two tube economizers D, where it is heated to nearly 100° C. by exhaust steam. Thence it goes to the top of a scrubber E containing wooden grids, where it meets a jet of steam which serves the double purpose of spraying and distilling. At the base of the scrubber, air heated to about 230° C. by passing through boiler flues is drawn in by an air-pump. The air laden with steam and oil vapours passes from the top of the scrubber first through the condenser C, and then through a long pipe before entering the compressor, thus allowing a certain amount of condensed steam and oil to separate before admission to the coal-gas purifiers.

The oil thus collected closely resembles a good-grade naphthalene solvent; the following being the average composition:—

	Per Cent. by Volume.
Up to 130° C.	1½
130° to 210° C.	77½
210° to 250° C.	17½
Above 250° C.	3½—100

The results now being achieved in the treatment of 3500 gallons per diem are—

1.—The separation and sale of the heavy tar.

2.—The recovery, by their addition to the coal gas, of light oils in the form of vapour; there being sufficient vapours of

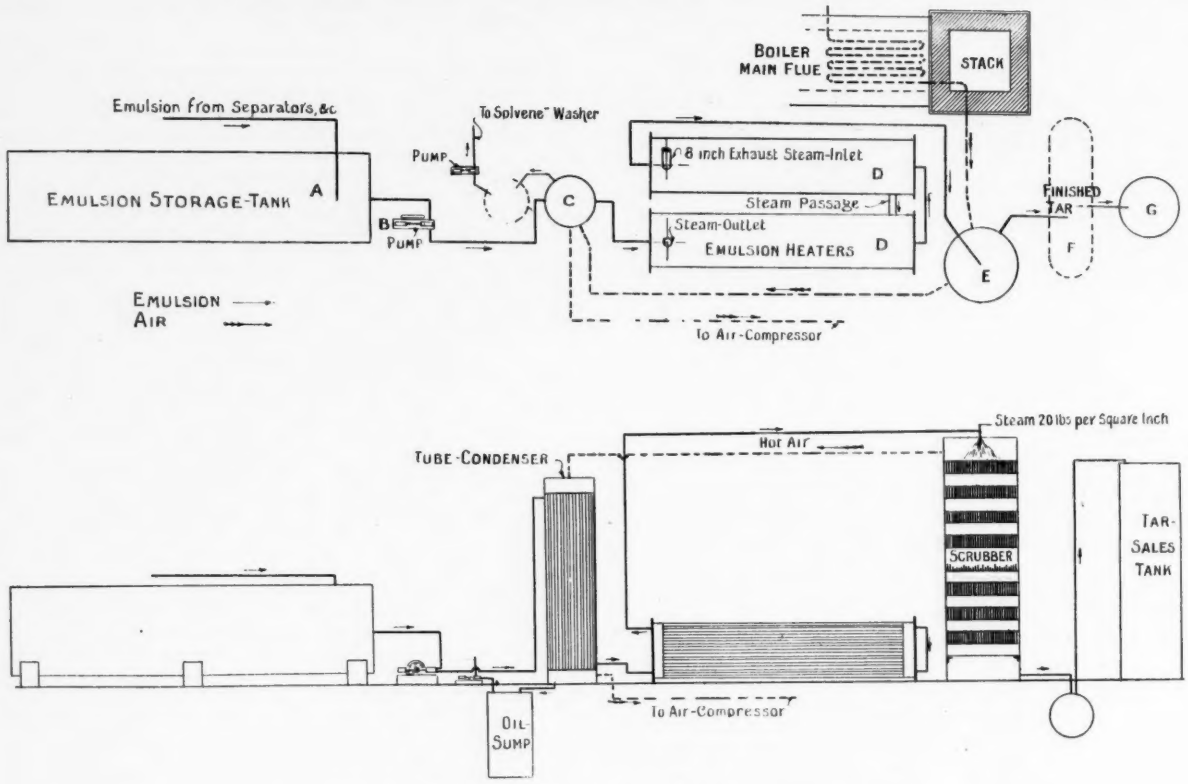


Fig. 1.—PLAN AND ELEVATION OF THE TAR EMULSION PLANT.

middle oils to allow naphthalene solvent to be dispensed with.

3.—It has been found possible to add a larger amount of air—3 per cent. or more—to the coal gas without loss in candle power. The reduction in purification wages thereby effected, taken over a period of several months, was found to be equivalent to ¾d. per ton of coal carbonized.

The plant was constructed out of second-hand tanks, &c., and did not cost more than £250; while the labour entailed does not amount to more than 2s. 6d. per diem. The quantity of high-pressure steam required is so small as to have no apparent effect on the figure for fuel used for boilers.

Low-Grade Coal Gas.

Leaving now on one side the question of substitutes, which we have seen cannot at present compete with the ordinary gas supply, we turn our attention to possible economies in the manufacture of coal gas itself.

The most obvious way to cheapen coal gas is to supply an inferior article; and there is always a strong temptation to do this. I fear there is a good deal of cant and hypocrisy over the question of the advantages of low-grade gas. The main purpose in making low-grade gas is probably in most cases simply the extension of the yield per ton and the resultant reduction in manufacturing costs. No doubt some gas engineers consider all tests a nuisance. The coal-weighing machine and the station-meter are all that they require in the matter of measuring apparatus. If there must be testing apparatus, they say, let it be a jet photometer or a recording calorimeter with a very close scale. The statutory requirement of minimum candle power (calorific value is only now beginning to be recognized) is perfunctorily observed. Ignorance spells bliss, or at any rate absence of worry. If we do not know that the gas is below standard, we need not take steps to enrich it or prohibit over-pulling. If we keep on extending the make of gas by the simple method of dilution until the customers cry out against it, we shall certainly effect economies for a time; but there is some danger that we overstrain the pocket of the buyer, who can most fitly pronounce on the quality of the gas when his quarterly account comes in.

With some systems of retort plant, we cannot help ourselves, however. In such cases, high candle power and calorific value can only be attained, as already remarked, by the great sacrifice of efficiency in other respects. Most gas engineers will agree that calorific value is of greater importance than illuminating power. The fixing of a principal standard for the former, with an easy subsidiary standard for the latter, is an important economy in gas manufacture, as it enables expensive enriching agents—such as carburetted water gas, cannel gas, benzol, and lime—to be entirely dispensed with.

The adoption of a low standard (say, 15) candle power as tested with the No. 2 burner, without reference to calorific value, would still mean to many gas undertakings a large reduction (in some cases 7 or 8 per cent., equal to ¾d. per 1000 cubic feet) in the cost of coal gas. In nearly every case—the principal exception being vertical retorts—there would be a concomitant diminution of the calorific value. The largest saving would arise where there is sufficient spare coal-gas plant to replace rich auxliiary gases, such as carburetted water gas. The only utility of water-gas plant would then be as a reserve for emergency, or till coke fell in price to a very low figure.

The main criterion of the cheapness of town gas is the number of net heat units 1d. can purchase; but candle power must not be lost sight of. On making careful investigation, I find that of the gas used for lighting in a large gas-works in Birmingham 40 per cent. is consumed with flat-flame burners; the balance being used with incandescent mantles. If the percentage of consumption in flat-flames cannot be very considerably reduced, who can say the lighting would not suffer if the candle power were sacrificed?

The following is an estimate showing a comparison between gas of high and low candle power, based on the results of actual tests: The cost of gas for lighting a works is £1000 a year. The candle power is 18 with the No. 2 argand, and 12½ with the best flat-flame; the proportion of gas used for incandescent lighting being 60 per cent., and for flat-flame lighting 40 per cent. If the candle power is reduced to 11 as tested by the No. 2 argand—being then 5 by flat-flame—two-and-a-half times the volume of gas will be required for the flat-flame burners to maintain the same illumination. If the calorific value is not reduced (and this is within the range of possibility), the incandescent lighting will not suffer. The cost of flat-flame lighting will thus become £1000, and the total cost of gas £1600—an increase of 60 per cent.

Gas, like all articles of commerce, ought in the first place to satisfy the purchaser's requirements. There are centres where the directors of a gas undertaking would not dare to attempt to economize by cutting out candle power altogether. Some radical changes must first take place in the methods of lighting.

Carbonizing Wages, Repairs, &c.

Looking at the table of costs of coal gas, we see that no great improvements are possible in the carbonizing wages, in repairs to settings and coke conveyors, or power. Interest and depreciation, which have been taken at 10 per cent., can only be curtailed by simplifying the settings; but we do not see any prospect of doing so without interfering with the fuel efficiency. It is true that horizontal retort installations are very much cheaper than vertical retorts; but they are not the best so long as residuals command a good price.

Fuel for Retorts.

Fuel for retorts is a very large item, and one that well repays the study of the economist. The normal amount of coke per 100 lbs. of coal carbonized is assumed to be 16 lbs. At 12s. per ton, this works out at 23d. per ton of coal carbonized. The methods that are usually adopted for arriving at the figures for fuel used are open to criticism, and no simple plan is reliable.

It would be altogether inaccurate to say the true criterion is the quantity of coke sold; for some coals give a total yield as high as 70 per cent. (14 cwt. per ton), while others produce as little as 55 per cent. (11 cwt. per ton). In other words, if the total make of coke per ton of coal were taken, week after week, at a certain fixed figure (say, 60 per cent., or 12 cwt. per ton, for example, as we used to do in Birmingham), the fuel figure obtained by subtracting the percentage made for sale would, with change of coals, often prove very erroneous, and sometimes ridiculously low. In the same way, a contractor's guarantee for a retort plant, of so many hundredweight of coke sold per ton of coal carbonized is of little value.

There is not much difficulty in ascertaining with accuracy the yield of coke from various coals, either on a large scale or in the laboratory. But even then we are not in a position to say with any certainty what our real retort fuel bill amounts to, for there is still the moisture factor to be taken into account.

Just as the gas may be diluted down to uncertain—I was going to say, certain—limits, so, too, the coke can be watered until it holds anything up to 25 per cent. of moisture. It is a very simple way of reducing the apparent "fuel to retorts" and increasing the coke sales. Thus, to take an extreme case, if the true percentage fuel is 16, the total coke 66, and the sales 50—all calculated on the dry basis—an addition of 25 per cent. of water to the coke makes the sales 62½ and the fuel (dry) 3½.

If previous custom has been to supply very dry coke, it is then a simple matter to effect a considerable economy which in the usual method of accounting would be shown as a saving in fuel. If, on the other hand, the coke has reached the limit of what is merchantable in respect of moisture content, a more scientific method will be the only means of economizing. Coke customers in their blessed ignorance will usually take coke with 10 per cent. of moisture as readily as they take it with 1 per cent. Owing to the danger of coke-stack fires, gas engineers have some excuse for selling moist coke.

That there is often gross waste in fuel going to the producers in the retort-house is undoubted. This must be so, owing to the impossibility of keeping the quantity of primary air constant under ordinary conditions of fire-tending. We have heard of elaborate devices for regulating both primary and secondary air, which, however, probably on account of their intricate or fragile mechanism, have been given up after a short trial. It is interesting to note that the Dessau settings are recommended to be worked with a slight excess of producer gas entering the waste gas flues. In this case, the draught on the bed is set definitely to the amount required for a given retort temperature; and the secondary air slides are kept at a constant height, so that the volume of secondary air is practically constant. The primary air slides, and only they, are altered from time to time, according to the degree of attention bestowed, with the idea of always keeping a slight excess of producer gas in the waste gases leaving the top of the retorts, as indicated by the blue flame in the waste gas flues. It is a question whether there is any real economy in this practice.

Brooke's Patent Air-Regulators.

I am pleased to be able to announce a notable achievement of a perfectly genuine character in the saving of producer fuel. It is the invention of Mr. Brooke, the Superintendent of the Nechells Gas-Works, at Birmingham. It consists of a very simple, counterbalanced, pivoted flap-valve fixed in the primary air port, and is adjusted to respond to slight variations in the draught, so that the volume of air drawn through the fire, and hence the amount of producer gas, is regulated and kept practically constant despite varying conditions of the fuel-bed. The beneficial effect of this arrangement is at once shown by analysis of the waste gases, and results in a remarkable saving in fuel. The following is a faithful statement of what has been accomplished at the Nechells works during the past twenty weeks—that is, since all the beds of inclined retorts were fitted with primary air-regulators. The coke figures for 1912, which are perhaps none too creditable (owing partly to strike troubles), are given for the sake of comparison.

Twenty Weeks ended Aug. 21.

	Coal Carbonized. Tons.	Coke Made for Sale. Tons.	Per Cent. on Coal.	Fuel Used for Retorts. Tons.	Per Cent. on Coal.
1912 . . .	42,360	20,710	48·9	7640	18·03
1913 . . .	45,860	25,900	56·5	4310	9·40
Saving on coal carbonized, 1913. . .				3960	8·63

Percentage reduction in fuel = 47·9.

At the rate of 12s. per ton for coke, the reduction of 8·63 in lbs. of fuel per 100 lbs. of coal carbonized is equivalent to 12·4d. per ton of coal, or about 1d. per 1000 cubic feet of gas, which, you will agree, is well worth striving for. I may say the only extra expense entailed, besides the trifling cost of the regulators, is the services of a young man with some chemical training, who analyses the waste gases and looks after the air adjustment. This increased cost of attendance is not a necessity; but on large installations it is bad policy to be niggardly in supervision. That the economy was not due to reduction in retort temperature, is proved by the following averages of weekly tests of retort temperature and gas multiple over the period in question.

	Average Retort Temperature.	Average Gas Multiple. Percentage under Test Plant Standard.
1912 . . .	1910° Fahr. ..	4·3
1913 . . .	1928° ,, ..	4·6

The whole of this reduction in cost of fuel cannot be credited to the air-regulators, as the weekly samples of coke taken for determination of moisture show a higher figure this year than last—7·01, against 5·04. It is a question how far these moisture tests are to be relied on; and it is not safe to give anything but an approximate figure for the net saving due to the regulators. It must have been at least 35 per cent. in our case. This is equivalent to over 9d. per ton of coal carbonized, or ¾d. per 1000 cubic feet of gas, as compared with last year—perhaps 8d. per ton.

We are now about to instal secondary air regulators in the inclined settings. These, we anticipate, will assist still further in cutting-down the fuel used to the lowest possible limits. The new 3½ million installation of Dessau settings at the Nechells works is being provided with Brooke's patent air-regulators throughout; and it is hoped the percentage of coke to retorts—usually rather high with intermittent verticals—will be very materially reduced. One is apt to think that there is not much use in trying to improve upon regenerative settings, which are the result of many years of scientific experiment and research. The lesson we learn is that simple and inexpensive devices may produce wonderful results.

Outside Mond Producers.

The idea of using outside Mond gas-producers under ammonia recovery conditions for the heating of ovens is being put into practice at the new coke-oven installation in Birmingham. For installations of larger capacity than 3 million cubic feet per diem, this, I am convinced, is a paying proposition, especially where cheap fuel—such as coke dust or coal slack—is available. The economy is very marked when compared with older conditions of fuel expenditure. It is questionable if we should stand to gain much over our present practice. And though the advantages of Mond ammonia recovery gas in heating coke-ovens on the regenerative reversal system cannot be questioned, there would be an element of risk in utilizing cold producer gas in the ordinary regenerative settings of vertical retorts. It is almost certain the washed producer gas will require a considerable amount of preheating to give the requisite combustion chamber temperature of 1350° to 1400° C.

Some little time ago, I was advocating the use of this type of producer gas for coal distillation, in spite of the very formidable capital expenditure; but after recent experience in fuel economy, I now find I have to carefully reconsider the question. I may say that we shall soon be in a position for experiment with Mond gas heating on two settings of vertical retorts—one intermittent and one continuous—on the Birmingham coal-test plant.

Boiler Fuel.

Boiler fuel in gas-works is another matter that amply repays close attention. The possibility of economizing depends chiefly on the prices obtainable for different classes of coke. For example, coke dust passing through $\frac{7}{16}$-inch screens does not find a ready sale, even at the low price of 2s. or 3s. per ton. Horizontal, inclined, and continuous vertical retorts produce from Derbyshire coals 4 or 5 per cent. of this dust per ton of coal carbonized; intermittent verticals, less than 2 per cent. Thus, with the former there may be something like 5000 tons of coke dust to dispose of after carbonizing 100,000 tons of coal. This low-grade fuel, containing usually about 12 per cent. of moisture and 16 per cent. of ash, can be burnt without very much trouble in ordinary Lancashire boilers using forced draught and supplying steam at 100 lbs. pressure, provided there is ample capacity in boiler plant. In the Nechells works during the past three months, on a coal gas make of 4 million cubic feet per diem, the net saving effected by displacing unscreened coke, breeze, and sinkers, by coke dust has amounted to nearly £30 per week (3½d. per ton of coal carbonized), despite the fact that extra labour and boiler power had to be employed. This is, of course, due to the difference in the departmental charges per ton between coke dust and the mixture formerly used.

Maintenance and Repairs.

Of the items included under the headings "Maintenance" and "Repairs," I wish to refer particularly to perhaps the largest—gas lighting. Under bad conditions, the cost of gas for lighting the retort-house only, even at the low price of 1s. 6d. per 1000 cubic feet, is as much as 3d. per ton of coal carbonized, taking an average for the year. Under favourable circumstances—that is, with designs for plant lending themselves to the most economical lighting—it should not exceed ¼d. for superior illumination.

Maintenance and repairs include a great many items of minor importance. Bulked together, they soon run up the costs of manufacture, if allowed to look after themselves. Proper supervision of these and other matters of expenditure is not possible without an efficient system of weekly and monthly dissection of costs. Wages can be scrutinized weekly; but materials are difficult to keep watch over. It is wonderful what large sums of money can be squandered in the course of a year by careless store-keeping. A good storekeeper soon saves his salary several times over. Stokers' gloves, shakos, sponge cloths, brass fittings, packing, oil, and waste are among the more important things to be watched. I have heard a manager of a large concern say he had effected a saving of £3000 a year by re-organizing the stores department; and when one remembers how numerous are the articles required for maintenance and repairs, and that little things have a way of adding up to amounts of startling dimensions, one can readily believe that such a large economy is sometimes possible.

Painting is an expense the curtailment of which may prove to

be false economy. Gasholders are generally well looked after in this respect; but the steelwork of purifier-houses, &c., is often neglected. The cost of gas may be appreciably reduced for a year or two by neglecting repairs of all kinds; but the average cost over a period of years will prove to be higher, owing to the shortening of the life of the plant, than it would be if repairs were systematically carried out. Owing to the keenness of competition, there is strong temptation to the gas engineer to cut down to the lowest figure all repairs that are not absolutely necessary to maintaining gas production. The high standard of maintenance of plant noticeable in the leading German gas-works is remarkable, and worthy of our emulation—especially in municipal gas-works—so long as it is compatible with cheap gas.

In addition to recording weekly dissections of labour costs and monthly figures of gas and water consumption and the more important materials, it is of great service to set out the principal cost items, both wages and materials, on curves in such a way as to allow different years and works to be compared; the progressive costs in each case being also shown on a separate curve. A complete cost system involves considerable extra clerical expense; but this can soon be recouped by prompt action in putting a stop to wastage.

Purification.

Next to fuel, purification is the largest single item of expenditure over which we can have control; and as new methods of removing impurities must be more or less bound up with the sale or working-up of ammonia liquor, sulphur, cyanogen and (one might also say) tar, there is a very wide field for discovery. Here I shall deal only with the old well-known scheme of purifying coal gas by ammonia—a process of which William Young was one of the great pioneers.

In order to get an estimate of the possibilities of a liquid purification process, let us look at the comparative market values of ammonia and some of its products; the market prices, calculated on the basis of a ton of nitrogen, being those that were published last December. These are—

	£	Ratio.
Ammonia, anhydrous	158·9	3·45
Ammonia solution, ·880	90·0	1·96
,, ,, ·920	85·2	1·85
,, gas liquor, 10 oz.	46	1
Sulphate of ammonia	71·7	1·56
Chloride of ammonia, grey	107·0	2·33
Carbonate of ammonia	132·2	2·87

The following important facts have a marked bearing on the question. With new methods of distilling ammonia liquor, it costs no more to make ·920 ammonia than it does to make sulphate, leaving the acid out of account. A certain proportion, up to 10 per cent. of the ammonia, can be recovered as chloride by treating the tar in the hydraulic or foul main without any outlay for hydrochloric acid; the chlorine being present in the original coal. Carbonate can also be manufactured by utilizing the carbonic acid already present in coal gas. For this product, however, there would probably be only a limited sale. On the assumption that 90 cent. of the ammonia is recovered as ·920 solution, and 10 per cent. as chloride, the gross income per ton of coal carbonized would be 56·9d., as against 41·9d. for sulphate (after deducting the cost of acid), or a gain of 15d. If recovered solely as ·920 ammonia, the gross income would be 55·5d., a gain of 13·6d.

I might mention that chloride is already being recovered in a few coke-oven works in conjunction with the direct production of sulphate from the gas. In one works that I have seen in Yorkshire, the recovery is said to be 3 lbs. of chloride, in addition to 36 lbs. of sulphate per ton of coal—their total value at present prices being 55d. Sulphur can be recovered in very pure condition. If this were to fetch top market price, the income, on a basis of 80 per cent. recovery, would be 8d., or 6d. more than at present. The cost of extracting cyanogen would be materially reduced, increasing the net revenue from this source by about 1d. per ton of coal. There is also an allowance to be made for the removal of carbon dioxide which necessarily results. This I would assess at 3d. per ton of coal.

Based on a plant to deal with the gas distilled from 100,000 tons of coal per annum, the following comparison might be made—

Purification.

	Oxide.	Liquid.
Capital cost	£25,000	£8000
Ground area (square yards)	6,000	1200

Credit.

	Pence per Ton.	Pence per Ton.
Ammonia	30	44
Sulphur	2	8
Cyanogen	2	3
CO_2 removal	—	3
	34	58

Debit.

	Pence per Ton.	Pence per Ton.
Interest and depreciation (10 per cent.)	6	2
Materials	2	½
Wages, repairs, and steam	2	4½
	10	7
Net income	24	51

Possible gain = 27d. per ton of coal or 2¼d. per 1000 cubic feet.

According to the above estimate, purification, instead of costing about 8d. per ton of coal carbonized, would bring in an income of 19d. A process such as this could not be so profitable on a small scale. It is questionable if it would be of much service on a works distilling less than 70 tons a day, owing to the amount of supervision that would be necessary. The estimate is made on the assumption that the working losses of ammonia are no more than in ordinary sulphate manufacture. Without very careful supervision, even under ordinary conditions of working, ammonia losses are sometimes considerable; and there is much to be said from this point of view in favour of direct recovery methods, especially for small works. A system of careful weekly stock-taking and testing is the best means of preventing losses, which usually arise through carelessness or faulty design of plant.

It is rather remarkable that the method of distilling and utilizing ammonia liquor in our Birmingham liquid purification trials is pretty much on the lines of those published by William Young in the year 1881. He took out a patent No. 1587 dated April 12, 1881, for "Manufacture of Mineral Oil and Ammonia." After publication, he found that his ideas of purification by ammonia were not altogether novel; and he entered a disclaimer restricting his claim to the first part. All the same, we are indebted to him for a very able description of a method of working; and I may be pardoned on this occasion for quoting at some length from his published specification, which included a sketch of a still [here reproduced] capable, with very little modification, of giving a high efficiency.

Fig. 2 illustrates the manner in which the fourth part of the invention may be carried into effect,* where the ammonia has to be manufactured into salts of ammonia—such as sulphate. The fractionating still arrangement consists of a series of vessels or compartments placed over each other; the bottoms of the vessels having a large number of tubular openings, or short vertical pipes, which are covered by thin metal cups held in position by a wire or rod fixed to the centre of the cup and hanging into the tubular openings. The cups are corrugated or perforated round the margin, to break-up the steam into as numerous streams as possible. The ammoniacal liquor is supplied to the still from a tank at an elevation, or by means of a pump, through the pipe at the top, and passes down from vessel to vessel of the still by overflow pipes projecting upwards into each vessel to a sufficient distance to maintain the right level of liquor in each. The ammonia and steam

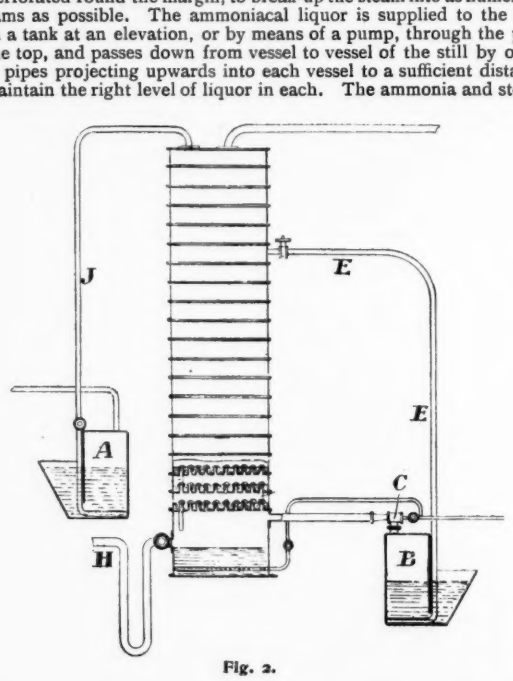


Fig. 2.

pass down by the pipe E into the saturator or vessel B, in which the sulphuric acid is placed. This vessel (constructed of wood, iron, or other suitable material) is lined with lead in the usual way. A curtain or partition prevents the steam finding its way to the air, and causes it to pass from the top into the bottom of the still. On the pipe is placed a powerful steam-jet (or its equivalent) of any suitable construction, as indicated at C; the steam being led into it from an adjacent boiler, the pipe having a branch pipe leading into the lower part of the still, and provided with a stopcock to enable steam to be led directly into the still when required. A is a similar supplementary saturating vessel, the use of which will be evident when describing the mode in which the process is conducted, which is as follows.

The whole of the chambers or vessels of the still, with the exception of two or three lower ones, having been filled with the ammoniacal liquor to be treated, and acid having been placed in the two saturating vessels A and B, the valve on the pipe J leading from the top of the stilling arrangement to the supplementary saturator A is opened, and the valve on the pipe E is closed. Steam is then admitted from the boiler directly to the bottom of the still, which steam soon raises the temperature of the ammoniacal liquor contained in it, causing it to give off the carbonic acid and sulphuretted hydrogen which it contains partly in solution and in combination with the ammonia. These gases, together with any little ammonia accompanying them, pass into and through the acid in the supplementary saturating vessel A; the ammonia being absorbed by the acid, and the gases passing away to a box containing hydrated oxide of iron, which absorbs the sulphuretted

* This extract has been slightly altered to suit the illustrations.—Ed. J.G.L.

hydrogen—the carbonic acid being allowed to escape. So soon as the temperature reaches about 180° Fahr. in the division or vessel of the still above the pipe E, the valve on this pipe is opened, and steam is turned on to the jet C. This causes the ammonia and steam in the still to pass down the pipe E into and through the acid in the saturator B, where the ammonia and the accompanying steam are both at first absorbed by the cold acid. But the acid soon becomes heated by the absorption of the gaseous ammonia and hot steam, when only the ammonia is absorbed, and the pure steam is drawn by the steam-jet and again passed back and up through the ammoniacal liquor in the chambers of the still. The steam is now turned off and a continuous supply of ammoniacal liquor turned on by the pipe above the still. The quantity admitted is such that it shall keep the last or upper vessel of the stilling arrangement comparatively cold—at least under 90° Fahr.—at the time that each of the successive lower vessels of the arrangement is hotter and hotter, till the vessel above the outlet contains liquor of at least 180° Fahr. This adjustment of the temperature may be also modified by turning on or off more or less steam entering the bottom of the stilling arrangement.

It will be evident that the advantages of this process are that the carbonic acid and sulphuretted hydrogen are dissociated from the ammoniacal liquor by the treatment in the upper vessels, and that the sulphur may be recovered; that the ammonia liberated from the liquor in the lower vessels of the arrangement is mostly in the caustic state; and that the same steam is, by means of a steam-jet, made to circulate continuously—repeatedly acting upon fresh quantities of liquor, and thus greatly economizing fuel.

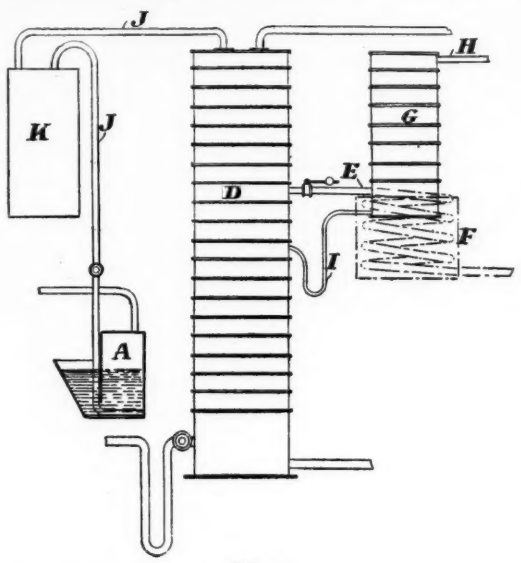


Fig. 3.

Fig. 3 illustrates the arrangement employed when the ammonia in the ammoniacal liquor is to be used to remove the gaseous impurities from illuminating coal gas. The arrangement, and its mode of operating, are substantially identical with those described for the manufacture of ammonia salts, with the exception that the steam is not made to circulate, but is supplied from any convenient source by the pipe at the foot of the still. When high-pressure non-condensing engines are used to exhaust the gas, pump liquor, and the like, the exhaust steam may be conveniently employed. The caustic ammonia and steam produced as before described, on leaving the stilling arrangement D by the pipe E, may be conveyed direct to the condenser and commingled with the impure coal gas, and thus allowed to absorb the gaseous impurities. But it is preferred first to cool the mixed steam and caustic ammonia by passing through a cooling coil of pipes indicated at F, immersed in water, where they are condensed, and the caustic liquor, with any uncondensed ammonia gas, is passed direct into a scrubbing arrangement similar in construction to the fractional distilling arrangements previously described, only, of course, larger in proportion to the volume of gas it has to pass—preferably entering at about the middle vessel or compartment of the scrubbing arrangement. Or the ammonia and steam may be fractionally cooled and separated to a large extent by means of the supplementary stilling arrangement G; the ammoniacal gas passing away by the pipe H, and introduced into the coal gas as it enters the scrubber or washer. The syphon bend between D and G is for conveying condensed water from the fractionator G back into the fractionating still D.

The modern improvements that have been made in William Young's methods just described relate mainly to better efficiency in distillation through attending carefully to the pressures in the still on the one hand, and to more effective washing by the use of improved appliances on the other.

Should the economies in candle power, fuel, and purification be realized, the cost of coal gas, ready for distribution, should be reduced to 4d. per 1000 cubic feet, with coal and residuals at the prices already assumed. If coal were 10s. per ton, the cost of the gas would be as low as 2d.

The natural consequences of cheap gas are increased output, utilization of coal gas for heating the retorts, the municipal prohibition of the use of raw coal for domestic and other purposes, and the advent of smokelessness in towns.

The PRESIDENT referred to the memory of William Young, which was being perpetuated by the Memorial Lectures. He said Young had the whole realm of gas making in front of him. His work was in the earlier days, when there was a wide and extensive field to tackle. They looked to the smaller things now, to make economies. Dr. Davidson had shown them the various ways by which they could reduce their working costs. To-day, when they were face to face with enormous prices for coal, anything they could do to cheapen the cost of production was a great advantage. He was sure they would all join in according Dr. Davidson their heartiest thanks for placing before them the many methods by which they could improve their working.

Mr. J. W. NAPIER desired to associate himself with the vote, and with what Mr. Macleod had said. He was sure the members would always be sensitive to the necessity of preserving a high standard of lectures in keeping green the memory of William Young. With regard to the possible introduction of Mond gas in gas-works, he said that from an economical point of view it had struck him as wasteful that in the use of fuel for their producers they did not obtain the nitrogen content as sulphate. Dr. Davidson had introduced in Birmingham a scheme to use coke breeze and obtain ammoniacal liquor. Any additional quantity of ammonia produced would give more work to the residuals plant. There was another thing. Instead of selling their coke breeze at half-a-crown per ton, this material would be of use for the purpose of heating the retorts, and they would have a production of sulphate of ammonia possibly to the extent of 40 to 50 lbs. per ton of fuel. He was sure this was a very profitable result likely to occur from the introduction of Mond gas into gas-works. He would like to know to what size of works Dr. Davidson thought such a process could be applied successfully.

Dr. DAVIDSON thanked his hearers for their cordial reception of his lecture. In reverting to the recovery of ammonia from Mond gas, he said the coke breeze which they had contained about 0·1 per cent. of nitrogen. The original coke contained 1·4 or 1·5 per cent. It was quite a new thing that they could actually get 70 or 80 lbs. of sulphate of ammonia from coke dust or coke breeze.

New Source of Motor Spirit.

It is announced that during the past few weeks the Petrol Substitutes Joint Committee have discovered a process by means of which it is hoped that fully 40 million gallons of British motor spirit will be available annually without further depletion of the country's mineral resources. Mr. Stenson Cooke, the Secretary of the Committee and of the Automobile Association, states that the Committee have tested a substitute which involves the utilization of a bye-product of coal hitherto unsuitable for motor fuel. The very fullest investigations have been made by experts, and the results are reported to be excellent. A full-sized commercial plant is now in course of building, and the Committee have every hope that this will be equally successful. During the past three years, the price of petrol has risen from 1s. 1d. to 1s. 9d. per gallon; and it is believed that any future change will be in an upward direction. The new substitute will be sold to the consumer at not more (probably less) than 1s. 2d. per gallon, and will, it is stated, be equal to the best quality of petrol.

Prizes for Manchester Junior Association Papers.

We learn from the Hon. Secretary of the Manchester and District Junior Gas Association (Mr. James Bridge, of Stretford) that Mr. Samuel Tagg, the Engineer and Manager of the Preston Gas Company, offers two prizes of £1 1s. each for the two best papers, of comment or criticism, relative to any piece of plant, apparatus, or method of working noticed on the visits to Bolton, Bury, the National Gas Exhibition, and the Manchester Electricity Station. Mr. Tagg is desirous to encourage the habit of thoughtful observation. Instances of what might be commented on are the following: The advantage (or disadvantage) of making air-tight or ventilating liquor wells; the welding of high-pressure main joints; the use of steel or cast iron for certain purposes; the advantage (or disadvantage) of a mechanical lubricator on exhausters; the method of lighting a retort-house; method of increasing coke sales, &c. The comments should be the results of independent observation and of original deduction from observed facts. One prize is to go to a man engaged on distribution and the other to one employed on manufacture; but a distribution man may comment on a manufacturing question, and *vice versâ*. The papers should be not less than 150 and not more than 300 words in length. All papers should be sent to the Secretary within fourteen days of the visit. A *nom de plume* should be used at the end of the paper; but the full name should be given to the Secretary. The papers become the property of the Association. Mr. Tagg will make the awards. The prizes will be presented at the next annual meeting, and will be of the winners' own choosing.

Lighting and Heating Exhibition at St. Petersburg.—The second International Exhibition of Lighting, Heating, and Gas Apparatus is to be held at St. Petersburg from Nov. 14 to Feb. 14 next. The exhibition is to be divided into five sections: (1) Lighting; (2) Heating; (3) Fireproof Appliances; (4) Chemical Products Used in Lighting, Heating, Gas Manufacture, and Fire Extinguishing; and (5) Measuring Instruments. Various questions connected with these sections will be discussed at a congress to be held at the opening of the exhibition. Copies of the programme may be had from the Commercial Intelligence Branch of the Board of Trade.

VICTORIAN GAS MANAGERS' ASSOCIATION.

Seventh Annual Meeting—Melbourne, Nov. 6 and 7, 1912.

THE Seventh Annual General Meeting of the Victorian Gas Managers' Association was held in Melbourne on the above-named days; the business being transacted in the rooms of the Victorian Institute of Engineers, under the Presidency of Mr. J. W. THOMPSON, the Chief Superintendent of the Metropolitan Gas Company. There were nearly fifty members present. The report of the proceedings did not reach us until yesterday; and we now give a general indication of what transpired, together with the President's Address and some remarks by the Hon. George Swinburne, who, as mentioned elsewhere, has lately been appointed an Interstate Commissioner, on the subject of his visit to England and the Continent—leaving the rest for a subsequent issue.

OPENING OF THE MEETING.

The PRESIDENT, in opening the proceedings, expressed his pleasure at seeing so excellent an attendance, and at meeting the members again after a twelve months' interval. He was very gratified by the presence of managers from other States.

CONFIRMATION OF MINUTES.

The minutes of the preceding annual meeting, which had been passed by the Council, were confirmed.

REPORT AND ACCOUNTS.

The report and balance-sheet having been taken as read,

The HON. SECRETARY (Mr. C. W. Howlett, of South Melbourne) said he was very pleased to state that the Association was making splendid progress. The present gathering of members was the largest they had yet had; and the Association was now on a fair working footing, with a cash balance in hand. The members, therefore, need have no further anxiety regarding the financial position.

The report and accounts were adopted.

NEW MEMBERS.

The following gentlemen, who had been nominated for membership and approved by the Council, were duly elected:

Members.

Mr. F. W. Sumner, Manager of the Wangaratta Gas-Works, formerly Manager of the Biggleswade (England) Gas-Works.
Mr. C. F. Broadhead, Engineer of the Brisbane Gas Company, late Engineer of the Middleton (England) Gas-Works.
Mr. Alex. Neil, Manager of the Footscray Gas Company.
Mr. Herbert R. Carr, Assistant Superintendent at the Metropolitan Gas Company's South Melbourne Works, late Assistant-Manager at the Carlisle (England) Gas-Works.
Mr. J. Dwyer, Manager of the Lismore (N.S.W.) Municipal Gas-Works.
Mr. J. Carter, Manager of the Grafton (N.S.W.) Lighting Company, Limited.
Mr. W. A. Simcoe, Manager of the Ararat (Victoria) Gas-Works.

Junior Members.

Mr. A. A. Macintosh, Gas Analyst at the Metropolitan Gas Company's West Melbourne Works.
Mr. H. J. Bleauchae, Gas Analyst at the Metropolitan Gas Company's South Melbourne Works.
Mr. L. Pickering, Assistant-Engineer at the Napier (N.Z.) Gas-Works.

Messrs. N. S. Kennedy and H. J. Grice, both of the Metropolitan Gas Company, Melbourne, junior members, were admitted to full membership.

ALTERATION OF RULE.

The following alteration of Rule 4, relating to the constitution of the Council, was then sanctioned: "The Council shall consist of a President, Vice-President, Treasurer, and five members to be elected among ordinary members of the Association." It was explained that the alteration would allow of the addition to the Council of a country member and a member from another State, and was therefore very desirable.

PRESIDENT'S ADDRESS.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—My first duty is to acknowledge my keen appreciation of the honour you have conferred upon me in asking me to occupy the presidential chair of this important Association. I have next to congratulate you on the continued interest in, and growing strength of, the Society, which year by year increases in numbers—adding 10 new members this day, making a total of 65—while in every way vitality is manifested, giving strong grounds for the expectation that the position already attained will not only be maintained, but improved and strengthened.

WORK OF THE ASSOCIATION.

The Victorian Gas Managers' Association has been established seven years. It may, therefore, now be an interesting inquiry as to how far the object of its existence has been achieved. It has collected, by means of its papers and discussions, an amount of information and experience on gas matters which I venture to say will be appreciated and made use of by all those engaged in the gas industry in the Commonwealth. Our "Transactions" contain a most valuable record of papers on carbonization, purification, naphthalene difficulties, experience in country gas-works, differential prices for gas, &c. The Association has thus been the means of increasing the knowledge of its members, making them more efficient managers, and has, therefore, not only proved a boon to the companies and local authorities by whom they are engaged, but the practical application of the knowledge thus gained must certainly benefit the gas consumer.

CARBONIZING PLANT.

Since our last meeting, when some of you had the opportunity of inspecting the Dessau vertical retort-benches then in course of erection at the West Melbourne works of the Metropolitan Gas Company, a smaller unit on the same system has been built at the Company's works at South Melbourne. This latter installation consists of a block of five beds, each bed containing eighteen retorts set in six rows of threes. Carbonizing operations were started with this plant on the 1st of August last, and so far the results obtained from it have been very satisfactory. Owing to the fact that three carbonizing systems are producing gas at this station, and the total make of gas is registered by one meter, it is impossible to state definitely the actual make per ton from the verticals; but the indications are that, working twelve-hour charges and introducing steam during the last two hours of carbonizing, they are producing well over 13,000 cubic feet per ton of coal.

You will recollect that Mr. Philip Holmes Hunt, the Engineer of the Metropolitan Gas Company, in his presidential address before the Association three years ago, predicted that probably a surprise was in store for us when carbonizing Maitland coal in vertical retorts. As is well known, this coal, under ordinary working with light charges, produces a very small coke; and the surprise has certainly materialized, because the plant at South Melbourne has produced, from Maitland coal, a very fine quality coke—large, close grained, quite equal to oven coke, and an ideal coke for foundry work. I will not dwell on this subject, as you will have an opportunity of learning more about the operation of the plant when you visit the works after lunch.

I do not propose to detain you long this morning with a presidential address, as we have several interesting matters to discuss and time is valuable. I have, therefore, put a few notes together which I trust may prove interesting, and which I have termed

THE QUALIFICATIONS OF A GAS MANAGER.

To fill the post of a gas manager efficiently, a man's physical and mental powers must be in full vigour. He should have a practical grasp of several branches of science, and be a good mechanical engineer; he should also have a knowledge of chemistry, and be a fair draughtsman. He must understand building in brick, wood, reinforced concrete, and steel structural work, and have a thorough knowledge of the setting of retorts. He must also understand the carbonization of coal, the manufacture of sulphate of ammonia, and the condensing, washing, purifying, storing, and distribution of gas—operations which require considerable experience and skill.

The effective distribution of gas is no trifling matter; for although dividends may be made in the retort-house, they may be quite easily lost in distribution unless care and skill are brought to bear in the reticulation of the various districts supplied. A gas manager should also possess a knowledge of high-pressure distribution, as this system is becoming more and more vital now that the modern and up-to-date incandescent burner is universally used. As is well known, this burner gives the best results only under a uniform pressure, and in widely extended districts, during the hours of peak comsumption, the gasholders cannot maintain an unvarying pressure. It therefore becomes requisite to have recourse to a high-pressure system with which to boost up the pressure by connecting it into the supply mains at various points over the area of supply.

It is interesting to note that the general experience both at home and in Australia seems to point to the conclusion that complete satisfaction can never be obtained from gas burners and other appliances under the present unavoidable variation of pressure which takes place in the mains; and the day is perhaps not far distant when the whole of the gas supply will be under high pressure, and each consumer's service be equipped—in conjunction with the meter—with a regulator or governor for reducing the pressure to a constant standard to which all burners, cookers, fires, &c., could then be adjusted. Another desirable qualification is the possession of a personality and address which will enable

the manager to satisfactorily deal with the varied body of workmen under his control, who, at times—especially in these days of labour unrest—are very difficult to manage.

In many instances the gas manager has charge of the distribution business in the district he supplies, and must be well posted with the latest information relating to new burners, mantles, cooking-stoves, gas-fires, bath-heaters, &c. He has probably to satisfy a far larger number of customers than the supplier of any other commodity, and will meet not a few possessed with an antagonistic feeling towards the gas undertaking, ever ready to make a grievance and find fault; and discretion, courtesy, and a certain amount of wit are essential in successfully combating and satisfying these chronic complainers. A gas manager is also beset with the constant anxiety lest, through the carelessness or thoughtlessness of workmen, accidents of various kinds should occur in the works or district, besides which he has the responsibility of preserving an uninterrupted supply of gas to his consumers, and, especially during such periods as the coal strike of 1910—when hardly pressed for coal—the lighting arrangements of the city or town depend entirely on his resourcefulness. It must also be remembered that he is to a great extent responsible for the judicious spending of large sums of money in keeping the works in running order with up-to-date plant, and also in providing extensions to meet the increases which are continually going on; and should a manager have to act as architect, designer, and builder, in addition to his other duties, his hands must be full indeed.

Economy in the construction of a manufacturing plant contributes largely to the cheapening of the cost of production; thus enabling the undertaking to reduce the price of gas to a minimum—a very desirable object, now that Parliament is taking a hand in regulating the price. One of the first essentials in planning and arranging additions and alterations to a works is for the manager to have a correct plan of the site before him, and to allocate thereon the most favourable positions for the buildings and plant—allowing space for future extensions, and paying strict regard to the proper sequence of the component parts of the plant. This method avoids the confusion which may otherwise arise by reason of backward and forward work being necessary with the main connections, where, for instance, the gasholders are placed between the retort-house and the purifying or washing plant, and other parts of the plant erected on any spot where space may happen to be available. The secret of successful working is to so arrange the works that, when they reach their maximum capacity, they may present an orderly and well-designed appearance, and admit of easy supervision.

I think, upon consideration of the necessary qualifications of the successful gas manager, you will agree with me that the position is no sinecure; and, without undue egotism, it may be fairly said that to capably fill such a post a keener and more varied knowledge is required than is essential with a similar position in any other profession.

At the conclusion of the address,

Mr. S. E. Figgis (Ballarat) said he had much pleasure in proposing a hearty vote of thanks to the President for his address. Members had been given something to think about regarding the qualifications of gas managers—a topic particularly pertinent to the consideration of the younger ones among them. It would be seen that the qualifications were numerous, and that the office of gas manager was indeed no sinecure. The President occupied a very important position in this city, being Chief Superintendent of the Metropolitan Gas Company; and it was surprising that he had found sufficient time to prepare such an address.

Mr. W. Pain (Bendigo) seconded the motion, which was supported by Mr. Aird (Townsville), and carried unanimously.

Papers and Discussions.

Mr. L. Rodgers read a paper on "Remodelling a Small Gas-Works;" and it was discussed. Mr. B. L. Taylor followed with one on "The Advantages of Wood in Gas Production;" but the discussion upon it was postponed.

The meeting then adjourned for luncheon at the invitation of the Metropolitan Gas Company.

On the resumption of the proceedings on the second day, Mr. Taylor's paper was discussed at some length.

Gas Affairs Abroad.

The President said that before going on with the "Question-Box," he would call upon the Hon. George Swinburne, M.L.A., to say a few words as to what he had seen on his trip to the Old Country and the Continent. Of course, Mr. Swinburne had been very busy, and probably had not had time to put anything on paper; but no doubt he would be able to tell them much that they would be delighted to hear.

The Hon. George Swinburne remarked that he had had such a lot of personal business to look after when he was at home, that he had not a great deal of time to visit many gas-works or inquire into the state of the gas industry there. Nevertheless, he was very glad to accept the invitation to say a few words on the subject.

One thing he was much impressed with in the Old Country was the continued energy of the electric light people, and, in London especially, the large number of houses that were fitted up with electric light. This was increasingly the case since he had been in London previously. But, in spite of it, the gas companies were still enlarging their output; and wherever one saw that a house was illuminated with electric light, invariably they found the cooking to be by gas. In fact, cooking by gas in the Old Country had reached such enormous dimensions that all the gas-cooker manufacturers were in a dilemma to keep up with the demand. Nearly all were extending their works. Even where electricity was very cheap indeed—in the North of England—the gas companies in places like Newcastle, Wallsend, &c., had had remarkable increases in their output. The large electrical company in the North, which was controlled by a Mr. Mertz, who was in Victoria now, was supplying electricity very cheaply indeed. In fact, on the North-east coast, where 5 per cent. of the population in England lived, they were supplying over 25 per cent. of the electricity used in England so cheaply that workshops, shipbuilders, and others were using it for motive power. The gas companies there and elsewhere had all this to contend with, and yet they were increasing their production. It was extremely satisfactory to know this, in face of such remarkably keen competition.

The thing that was helping the gas companies in the Old Country, and all over the world, was that during the last two years petroleum products had steadily risen in price—in fact, the total advance in the last two years of illuminating oils had been from 50 to 100 per cent. This helped the gas industry, because in the homes of workmen and the poorer class of people the result had been that in tens of thousands of cases they had abandoned oil and taken to gas. Petrol had risen. If one wanted oil for fuel, it was difficult to get a quotation extending over a term. Nevertheless, when he was in the North of England the shipbuilders had 58 oil-ships building which were intended to carry oil; so it might be imagined the enormous amount of oil it was expected to deal with.

He need not tell them that pressures were increasing all round. Nearly every gas manager found it necessary to increase his pressure. They also knew probably what was being done in the matter of lamp-controllers. In a large number of towns in England lamp-controllers were being adopted; some of them having clockwork controllers, and some pressure controllers. In Newcastle, they were putting down 250 Alder and Mackay pressure controllers.

An interesting thing that he found in London was that the manufacturers of lamps were investigating a patent that was said to give 60-candle power per cubic foot on a low-pressure lamp. As all knew, everyone was after lamps which would give a high illuminating power and could be worked with the ordinary pressure available, if it were possible to get such lamps. He saw some beautiful lighting in London, especially in Regent Street and Piccadilly and adjoining thoroughfares, which were lit by the Gaslight and Coke Company under the high-pressure system. They were the best lit streets in London, even compared with those by the electric system. Of course, the streets in London were extremely well lit. In most streets there was a lamp about every 20 yards. This could not be arranged in Australia.

When he was in England, he had written out a few notes in reference to a continuous sulphate-making plant, which were as follows:

"I went to the Farnham Gas-Works with Mr. Hunt and Mr. Shoubridge, and saw the latest Wilton's continuous sulphate-making plant. The only part which is continuous is the washer. All the gas is passed through the washer of special make and design, filled with a weak solution of sulphuric acid. This weak solution extracts the ammonia direct from the gas. In fact, it simply means that the gas is washed in a weak solution of sulphuric acid instead of the ordinary ammoniacal liquor or water, as in the Livesey washer. It is very necessary to keep the solution at a proper degree of weakness—not to allow it to become mere water, or not to raise the Twaddel percentage of the acid. The acid flows over into a tank, and is re-pumped through the washer till the liquid reaches about 45 to 48 Twaddel of ammonia. It must not be allowed to reach 50, as when it reaches 50 sulphate crystals form in the washer. As the sulphate plant may not be working continuously, the liquid, when it reaches the necessary Twaddel—45 to 48 per cent.—is allowed to go into the storage tank ready for the evaporator.

"The ammoniacal liquor from the hydraulic main and from all the pipes up to the exhauster is dealt with directly in a still, where the liquor is evaporated, and the gas sent off from the top of the still into the gas-pipe before it goes into the washer; so that it really joins the ordinary gas, and the ammonia is caught in the solution of sulphuric acid. The sulphate turned out was of a very beautiful white colour, very good indeed; and they were getting about 23 lbs. of sulphate per ton of coal. One of the most important things to see about it is that no tar should get forward to the acid washer. The condensation plant, therefore, must be very good. In fact, it is advisable that a Pelouze tar-extractor should be inserted after the condenser to arrest any tar which may not have been taken out by the condenser. It considerably militates against the washer if the tar goes forward.

"Another point in connection with the plant is that it practically does away with the scrubber and the Livesey washer. You might say it puts them out of action. Mr. Saville, at Farnham, was using the scrubber as a dry condenser, having left the boards in. He, however, could not pass water through it, because it would have meant dealing with the water in the still or working it up to a higher specific gravity. There is no attempt to work the ammonia from the hydraulic main up to a higher specific gravity as it

comes from the hydraulic main. Of course, it can be allowed to stay in and gradually overflow; but it is a long way short of the Twaddel specific gravity of the ammoniacal liquor ordinarily dealt with in a sulphate plant. As you know, the liquor is often pumped over the scrubbers and washers, in order to raise the specific gravity before manufacture of sulphate. If Wilton's plant, however, is put in, it throws out of use the scrubber and washer; all the work of ammonia extracting having been done by the acid washer. It is wonderfully efficient in this respect. The great point in favour of these continuous plants is that the effluent after sulphate making is very harmless. Mr. Saville was using it all up in the ash-pans of the retort-house. In the ordinary way, what is called the 'devil liquor' from an intermittent sulphate plant is rather bad, and the authorities object to it being put in the sewers.

"At present, at Farnham, it is costing about £4 per ton to manufacture; but they are getting acid for £2 10s., and are only paying a man to work the plant 30s. a week of seven days. I do not think we could get acid under £3 10s. or £3 5s.; and we certainly could not get a man to work the plant under £2 16s. to £3. It therefore makes a considerable difference; but still it would leave a margin if we could sell all we make at (say) £13. The plant, with the exception of some brickwork, roof, foundation, &c., at Farnham cost about £550. I expect therefore to erect a similar plant in Australia would cost about £800 or £900.

"A good deal of experimenting has been done in connection with it. There are only three plants at work at the present time—Dunstable, Woking, and Farnham. At Woking, they had considerable trouble, because it is a chemical operation and wants attention, especially in seeing about the proportion of acid solution in the washer. But the plant has been working at Farnham since February; and Mr. Saville said it was all that could be desired. It gave them no trouble, and did not require much skill. It, however, needed a little knowledge of chemistry and adjustment, and at first wanted the attention of the manager, until the men got into the way of working it. In starting a works, it would be a saving, because it would be unnecessary to put down scrubbers and washers."

Continuing, he said there was not much more to state that was new. He had sent Mr. Hunt particulars of a new coal discharging ship that would reduce the price of coal as landed here. Lumping on the wharf cost 9d. per ton. Messrs. Doxford and Sons were making a ship fitted with mechanism whereby the coal slipped from the bunkers on to a belt; and by means of the belt 1200 tons of coal an hour had been discharged mechanically without being handled.

There were other things which he had looked into from the commercial point of view. One was the question of depreciation being allowed in connection with gas-works in regard to income-tax. He had sent his brother and Mr. Hinde, of the Metropolitan Gas Company, particulars of an arrangement made in England between a committee there and the Income-Tax Office, whereby definitely, and without any further legal nuisance, proper depreciation would be allowed in connection with gas-works plant on payment of income-tax annually. It was a matter that was often disputed here by the Income-Tax Authorities. Seeing a precedent had been made in England, there was no reason why they should not get fair depreciation allowed here.

He had not the pleasure of being at many meetings of the British Gas Institution, because, as a delegate to the Empire Chamber of Commerce Congress, he had to be a great deal there. But he got to the Gas Institution excursion at Cambridge; and, as delegate from the Victorian Gas Managers' Association, he was very well received. The President asked him to speak. The members of the Institution were exceedingly kind, and asked him to convey to this Association their cordial goodwill—mentioning particularly that they were glad he was there as forming some connection between the gas managers of Australia and the Institution in England. It was owing to him being Vice-President of the Victorian Gas Managers' Association that he received a great deal of attention at the hands of the English Gas Institution.

The Question-Box.

The subjects deposited in the "Question-Box," on which information was required by the members, were then dealt with. They were as follows:

1.—What is the best method of treating foul oxide for revivification, and is it necessary to have a roof over the revivification floor? What kind of floor is the most suitable?
2.—What is the best form of exhauster for gas-works—the steam-jet or the rotary?
3.—Would it be advantageous to form a Gas Publicity Committee?
4.—Are gas-fans extensively used, and do they give satisfactory results?
5.—What methods could be adopted to further the interests of a gas company? Is it advisable to introduce a system of free maintenance for stoves and incandescent burners?

The Status and Title of the Association.

Mr. B. L. Taylor gave notice that he would move at the next meeting that the status of the Association be altered. He found that the membership was now 65, of which number 13 members were from other States. He would move—"That the title of this Association be altered from 'The Victorian Gas Managers' Association' to 'The Australasian Gas Managers' Association.'"

Election of Officers.

The following office-bearers for the year 1912-13 were then elected:

President.—Mr. W. Pain, of Bendigo.
Vice-President.—Mr. T. Lord, of Geelong.
Member of Council.—Mr. Philip C. Holmes Hunt, of Melbourne.
Auditors.—Mr. J. Lord, of Williamstown, and Mr. F. Tipper, of Melbourne.
Hon. Secretary and Treasurer.—Mr. C. W. Howlett, of South Melbourne.

Votes of Thanks.

Votes of thanks were then cordially passed to the President and to the Hon. Secretary and Treasurer; and the proceedings closed with an expression by the members of their appreciation of the courtesy of the Victorian Institute of Engineers for allowing the Association the use of their rooms.

Entertainments and Visits to Works.

After the luncheon at which the members were entertained by the Metropolitan Gas Company, already referred to, the members visited the gas-works at South Melbourne, in order to inspect the Dessau vertical retorts. On assembling in the office at the works, the Company's Engineer (Mr. Philip Hunt, M.Inst.C.E.) gave a short explanation of the system of operating them. After the inspection, tea was served in the sulphate house. At the resumption of the proceedings on the second day, Mr. Hunt was cordially thanked for the privilege accorded to the members.

On the afternoon of the second day, the members were conveyed to the Brighton Gas-Works, where an inspection of the plant was made under the guidance of the Engineer (Mr. H. V. Mitchell). Subsequently light refreshments were served. Mr. Hunt proposed a vote of thanks to the Hon. W. A. Adamson (one of the Directors), to Mr. Mitchell, and to the Company; and it was cordially passed.

On leaving the works, the drive was continued round the beach to the Hampton Tea Gardens, where the party, at the invitation of the President, partook of afternoon tea; returning later to the city after a most enjoyable outing.

Water Purification by Ozone.—An examination has recently been carried out by Messrs. W. J. Dibdin and Son, on behalf of Ozonair, Limited, of water treated in an ozonizing plant erected by the latter firm at Knutsford. Samples of five descriptions of water were tested: (1) Lake water; (2) water from the outlet of the top filter; (3) from the rising main; (4) from the lower filters; and (5) from the ozonizers. While the lake water is described as turbid and yellowish and Nos. 2, 3, and 4 were clear but slightly yellow, the ozonized water was clear and white. On cultivation on gelatine plates, the colonies of organisms obtained per cubic centimetre were 343, 380, 2337, 2000, and 62. *Bacillus coli* was detected in 1 c.c. of No. 1 and in 10 c.c. of Nos. 2 and 3, but was absent in 100 c.c. of Nos. 4 and 5.

The Doherty Gas Producer.—Mr. Henry L. Doherty, of New York, has taken out a patent for the United States (No. 1,066,717, July 8, 1913) for a gas-producer. An abstract of the specification contained in the "Journal of the Society of Chemical Industry" shows that coal is supplied continuously to the producer chamber, through the upper part of which several tiers of horizontal flues extend; the upper surfaces of the latter being adapted to retain portions of the coal. The flues of one tier communicate at one end with those of the tier above, and at the other with those of the tier below; the flues of the uppermost tier discharging into a common channel communicating with a gas off-take. The inlet ends of the lowermost tier are connected by means of a flue with channels through which gas is withdrawn from the chamber. The lower part of the latter communicates with a draught-producing apparatus, from which connections also extend to the upper part of the chamber, and to a source of products of combustion.

Ignition of Mine Gases by the Filaments of Incandescent Lamps.—This subject was dealt with by Messrs. H. H. Clark and L. C. Ilsley in a "Bulletin of the United States Bureau of Mines" (No. 52, 1913). Most of the experiments were made with a mixture of 91·4 per cent. of air and 8·6 per cent. of natural gas containing methane 82, ethane 16·4, nitrogen 1·5, and a trace of carbon dioxide. Tests were made with 1219 standard lamps and 234 miniature lamps. The naked filaments of all standard lamps, operated at rated voltage, will ignite the gaseous mixture used. All classes of standard carbon lamps will sometimes ignite the gas when the tips of the bulbs are broken off. The filament temperature of all classes of standard lamps, and of all but one class of miniature lamps, can be increased to such a degree that the lamps when smashed will ignite gas. When the bulbs of lamps burning at rated voltage were broken, the results showed that 55 and 100 volt lamps of all candle powers ignited gas under the conditions of the tests, and that 32 and 50 candle power 55-volt lamps invariably ignited it. The 8-candle power 220-volt lamps gave no ignitions, and, in general, the percentage of ignitions obtained from lamps of given candle power decreased as the voltage increased. When the tips of bulbs were broken, the percentage of ignitions increased as the candle-power rating increased, and decreased as the voltage rating increased. Though no class of lamps gave 100 per cent. ignitions, all classes caused some.

THE NORTH BRITISH ASSOCIATION PAPERS

Read at Greenock, Sept. 4.

At last week's meeting of the North British Association of Gas Managers, it was arranged for the three papers submitted to be discussed together; and they were taken as follows: (1) "Some Notes on the Sales and Distribution Department," by Mr. R. Halkett, of Glasgow; (2) "Developing the Sale of Gas; and Income Tax Depreciation," by Mr. J. B. Scott, of Cowdenbeath; (3) "Free Gas Appliances," by Mr. David Vass, of Perth. The papers are here given in the order in which they were read; and the report of the discussion on them appears on p. 700.

SOME NOTES ON THE SALES AND DISTRIBUTION DEPARTMENT.

By R. Halkett, of Glasgow.

In choosing this subject for my paper, I have been guided by the hope that, in my treatment of it, I may perhaps be able to present to you a few useful suggestions for carrying on the work of a department which is so rapidly gaining in importance in the gas undertakings of to-day.

It would occupy more time than is now at my disposal to sketch a scheme in detail; and it is difficult to say anything that has not been said by others at some time or another. So that a repetition would be merely tedious both to you and to me. Necessity makes apt pupils; and after all, when occasions offer, we are usually able to rise to the emergency and find a remedy for the evil that confronts us. I have spent a strenuous season in Glasgow inaugurating a scheme of this kind; and anything that would interest you, I shall be very pleased to show and explain to any individual member present, if he will visit me there.

The card system of book-keeping is more efficient than any other; in my opinion, it cannot be too strongly recommended. By it, information concerning any business transaction on the district can be obtained in a very short time; and it also constitutes a sort of diary of every house containing a gas appliance, no matter of what description. This is often of great service.

The keen competition of our electrical friends, and the methods they sometimes employ to belittle gas, have stirred in us a very wholesome spirit of progression. We know that we have a good article for sale in gas, and one which will serve the public in our districts faithfully and well. Therefore, it behoves us to do all in our power to make known the qualities and the serviceability of the commodity we have for sale; and this can only be done successfully by means of a well organized scheme. Manufacturers are assisting us by bringing science and skill to bear in the making of appliances; so that we now have articles to put upon the market that are thoroughly hygienic, economical, and labour-saving. It remains for us to sell them, and to organize a good distributory system to supply them.

With this object in view, gas undertakings have seen the advisability of opening up fittings departments, and keeping their own staffs of competent workmen, so that the work may be developed under their own care and control for the benefit of the industry and the welfare of the public. Many undertakings have their sales and fittings departments well in hand; but there are still very many who are yet meditating the step. Municipal undertakings hesitate—fearing lest they prejudice the business of local tradesmen. But I think this fallacy is rapidly falling away. Instead of depriving a tradesman, by gaining their co-operation much business can be put in their way by the gas undertaking, and a good feeling be made to exist between the two. Where local tradesmen look askance at the trading of gas undertakings, I think we shall find the fault lies largely with ourselves. We must endeavour to wear-down prejudice.

Courtesy Most Essential.

From the highest official to the lowest employee, civility of manner and speech should prevail, under the strongest provocation. I have known the use of gas to be strongly prejudiced for no other reason. An inspector lacking courtesy and tact can soon rouse the ire of the local tradesmen, whose work he inspects, or cause the consumer to condemn gas and instal electricity. The fitter by being uncivil, unobliging, and untidy in his work, can bring about the same results; and the showroom assistant can turn many a profitable customer discontented from the door by lacking in civility and the willingness to oblige. By taking a friendly, sympathetic, or conciliatory tone, as the occasion may require, while still remaining firm and just, the superintendent in his letters, or by interviews, will invariably obtain very satisfactory results. In the sale of gas and gas appliances, the main object is to make the public feel we are out to do our best for them, and that only in so doing are we benefiting ourselves, while in all things we are honest and just.

I think that sometimes our commercial departments are not so productive of good results as they should be. I mean, they could do more. We suffer—as, after all, everything in its infancy suffers—from "lack of experience." Time alone can remedy this; and as the commercial side of gas undertakings has advanced from infancy to early youth (shall we call it?), I think experience has taught us several lessons.

The Gas-Fitter and his Training.

First and foremost, we have discovered that, though we have plenty of raw material to our hand, it all needs shaping and moulding to our requirements. We have plenty of gas-fitters who are good at fixing pipes and running supplies, but who have no conception of the construction of a gas-fire, or of the workings of a gas water-heater. Yet unless they understand these and know the conditions under which satisfactory results can be obtained, their work cannot be depended upon. It is not sufficient that they rely upon the inspector to put them right; for he cannot afford to stand by them and see them do the work. After lining it out to them, and telling them what to do, it is essential that he should feel sufficient confidence in them to know that they will carry out his instructions, with an occasional visit of inspection from himself. It is from among the fitters that we look to promote good inspectors.

If we give each of our fitters an apprentice or mate to work with him, we should be making ample provision for the future. Many of our men would be glad of the opportunity for their sons to gain the training and the certainty of a steady job so soon as they were qualified for it. Realizing, too, the way in which they are handicapped themselves by lack of education, they would see to it that their sons obtained all that was necessary; and this is easily done in these days of evening classes and free lectures. However good a scholar a lad may be when he leaves school, it is all speedily lost unless the practice is maintained; and it is essential that to make good inspectors the fitters must be ready writers and calculators. As fitters, they have not the need, but they can easily be kept in practice if, after a lecture which they have been encouraged to attend, they are offered a prize for the best essay on the subject, or the best answers to a set of questions referring to the daily tasks. Once a month would be sufficiently frequent, and not be too great a tax upon their time.

Mr. Goodenough in his paper at the Institution meeting in June put before us a splendid scheme for the training of the gas-fitter of the future; and I think, with modifications and alterations to suit our special needs, it is a scheme that could be adapted for the young apprentice and mates. What I am suggesting now is more especially for the present-day fitters, who are still young men and ambitious of promotion, but whose school days are a thing of the past.

You will have noticed that I mentioned lectures just now, and will, therefore, be prepared to learn that I appreciate the educational value of a course of lectures during the winter months for the employees of a gas undertaking. There is no better method of keeping all classes in touch with the most modern appliances, their uses, their fixing, and their requirements under certain circumstances. These lectures, however, should be brief and interesting, so as to retain the interest of the men, without too great a strain upon their physical well-being. They have to be given in the evenings, when the men have done a day's work, and are accustomed to relaxation. It is better, therefore, if possible, to let them take the form of a social hour together—the lecture first, and then a short discussion, when the men are invited to ask questions and express their views, accompanied by light refreshments to terminate the evening. The trouble is to tempt the men to attend the meetings; but I think this difficulty will be overcome when it is recognized that those who take sufficient interest in their profession to follow it up thus will be the likely candidates for promotion.

Another difficulty in connection with the course of lectures is to find suitable lecturers. They need to be practical men, whose words can be proved reliable. In many cases they are chosen from the ranks of our own officials; but I think we could improve upon this, by inviting outsiders also. Some of the antipathy of our local tradesmen might be worn-down by inviting them to spend an evening in this way, and making them feel that we are all working together for the common good, and desire, above all things, unity and harmony. Then we have the manufacturers ready (as we know) to lecture on their appliances; and they can do much good, both for the gas profession and the gas industry, by giving perfectly unbiassed lectures. They have no need to specialize their own appliances. The fact that a member of a certain firm gave a splendid lecture will do more for the sale of their special apparatus than if numerous advantages were claimed for theirs over other makes—so noticeable in many lectures that have been given.

A contribution from a member of the staff is a thing to be appreciated. The member most fitted to do this, in the sales and fittings department, is, of course, the district inspector. He is the man with experience, and who knows just in what the men are

lacking. But the district inspector, if a conscientious worker, is one of the hardest pressed men on the staff. I think many of us overlook the great physical strain borne by our district officials, especially if a proper supervision of their districts is maintained, and are apt to forget that he is longer called upon to face all weathers than any other official in the department. I think, when we appreciate the good work they do, it is not too much to grant them sufficient time for preparing their lecture—putting on a "relief" inspector for the district. Consideration shown in this respect will, I am confident, be repaid amply by the official, and prove conducive to voluntary contributions that would otherwise not be forthcoming.

It seems scarcely necessary to enumerate lectures that would be of value; but perhaps I might here name one or two to point my few remarks, and show clearly the course I would have such lectures take.

1—The piping of a house—by a local gas-fitter.
2—Gas-fires—by a representative of makers.
3—Trouble to look for in fixing a fire—by one of the staff.
4—Gas-cookers and complaints—by one of the staff.
5—Water-heaters—by a representative of makers.
6—How to fix a water-heater—by one of the staff or a local gas-fitter.
7—Complaints and how to deal with them—by an official.
8—Gas-furnaces—by a representative.
9—How to deal with consumers—by one of the staff.

Commercial Training for Officials.

At the present time, a great deal is said about the education and training of the gas-fitter, and the subject is taking up a great deal of valuable time among several of the leading men in our profession; but I would like to suggest that we should also properly train men for the other posts and situations in connection with the outside departments. So far as it is possible, nothing can be better than the promotion of one's own men; but it is not fair to those under us to put over them an official incompetent in training and experience.

Many of the higher officials of to-day see their deficiencies, and are quietly training themselves in the qualifications they lack. But a certain amount can never be made up; and their inexperience costs their department dearly in the long run. This state of affairs should not exist in the future; and if it is good to take pupils for gas manufacture, as embryo gas engineers, surely it would also be a step in the right direction to train pupils in the commercial section of a gas undertaking.

The commercial instinct is born in some men; but it also needs fostering and training. To a great extent, it needs training in a practical sense. Nothing gives the head a firmer hold on his subordinates than for them to realize that he is thoroughly familiar with the work as well as the commercial side of it. Therefore if we took youths of good standing and sound education, and bound them to three years' workshop experience, followed by two years' district and office work, we should have men with practical experience ready for any post in the future.

The dearth of really competent men for the outside department is one great present-day evil. Our advertisements bring forth applicants from all branches and professions, with scarcely any qualification for the duties they are asked to fulfil. A specializing in just one branch does not lend itself to utility in dealing with all. Particularly does this apply to the official of the outdoor staff. To hold successfully the higher posts, his training needs generalizing in the many subjects with which he has to deal. In the practical branches, he needs an acquaintance with gas-fitting, service laying, main laying, and meters, and also a respectable knowledge of modern gas appliances. Much can be learned theoretically; but unless the practical proficiency is there also, needless trouble and expenditure are bound to accrue to the department which he controls. A certain amount of clerical knowledge is also essential if he is to organize and develop record keeping intelligently, and a ready mathematician has an advantage in dealing with both the consumer and with the manufacturers of gas appliances. Experience should widen his knowledge; but he should also know a certain amount first. However good his subordinates may be, the department can never attain complete success without a competent head, any more than a competent head can work with an incompetent staff and obtain completely satisfactory results.

Until, however, we train men for these positions, we must, of course, do the best we can with what we have. It is a difficult matter to judge a man from his testimonials. In the good-natured endeavour to help him on in his career, a great deal more is often said, if not in actual words, by inference, than is really justifiable. For instance, a man may have spent a few weeks in a certain branch, and after that claims that he is experienced in such and such a thing. It is impossible for us to discriminate in what is said if testimonials support these claims of proficiency; and, consequently, we are caused a great deal more trouble, expenditure, and anxiety in making an appointment than should really be necessary. It is very rough indeed on the proficient man, when his weaker competitor has testimonials as favourable as, and often more so than, he himself. I think this is an injustice quite unintentional, but one which lies within our power to remedy.

We require earnest workers in the Commercial Department, with the welfare of their profession at heart. The public schoolboy, who, after an expensive education looks to the future to hold a post of authority, and draw a good salary, will do very well if he is ready to go through his training and prove himself a man of deeds. It has been suggested that this class of lad will never consent to handling the tools and being trained in this way; but I fail to see why there should be any objection, when overalls are readily donned to enter an engineer's shop. Unfortunately, the modern tendency is to consider manual labour demeaning, and preference is given to a "kid glove" post.

The success of a commercial department also depends largely upon the state of contentment that exists among the employees. Good work, or, shall I say, the best work, will never be obtained where discontent runs rampant. A man's qualifications are worthy of adequate remuneration; and when I read in our professional papers advertisements offering a mere pittance for qualifications which have cost money, time, and labour to obtain, I marvel that any man should dream of making application. In order to maintain his position socially upon the stipend, the successful candidate would need to deprive himself of much that was necessary. A man is worthy of his hire, and should have due consideration shown him.

The Showrooms and Staff.

The showrooms are a great asset to the gas undertaking. It is needless to point out that they should occupy a prominent place in the shopping centre of the town, and should be attractive, so as to readily draw attention. By this I do not mean that the windows should be crammed with appliances or placarded all over. It is far better to have one or two objects to stand-out distinct, with a notice giving brief but useful information regarding it, than to tire the eye with too many and fix attention on no particular one. The window-dressing should be seasonable too. Do not show water-heaters in winter, and gas-fires in summer, but show each just immediately preceding and during their proper season. Gas cookers, water-heaters, and laundry appliances can be exhibited in spring and summer, to be removed in the autumn and winter, when gas fires, burners, &c., should hold sway, and tempt consumers by their cosiness and convenience.

The interior should correspond with the window display, though a selection of all gas appliances should, as far as possible, be at hand. Let the most prominent goods be those in season. Have them tastefully displayed, and, if space will allow, show them in actual operation, and amid their natural surroundings. Tradespeople have been known, for the sake of advertisement, to lend (say) the furniture of a dining-room; so that gas-fires and gas lighting can be shown to advantage. The same applies to a drawing-room. It is a simple matter to fit up a bathroom and kitchen, if space will allow, and show the gas appliances actually at work. Restrict the use of the show-rooms to exhibiting and sale purposes, and (if the premises are sufficiently large) for demonstration purposes also, as, if other duties are thrown upon the show-rooms, the consumer is apt to be neglected to a certain degree, and this is far from being desirous.

I have found it necessary in Glasgow to make alterations in this respect. The whole of the business in connection with the fixing of gas-fires was transacted at the show-rooms. That is to say, orders were taken there, fires were issued from there, and only orders to fix were sent from them to the fitting department. I need hardly point out the disadvantages of such a system. Not only did it entail a considerable amount of extra work, but it also caused a considerable amount of confusion. It meant that the orders were being doubly handled, and one department was dependent upon the other, and neither of them was responsible for the actual execution of the work.

It was almost impossible, in the heart of the busy season, to alter the system; but immediately the demand for fires slackened, the whole of the practical work was transferred to the fittings department. The show-rooms now simply deal with the consumers, and transfer the orders; and so far as they are concerned, their interest in the matter is completed. Once the order is passed through, the workshops become responsible for the prompt delivery and fixing of the appliance, and the show-room staff are free to give the consumer every attention.

So much has already been said of the requisite qualifications of the show-rooms manager and staff, that I do not need to repeat it here. If they possess any practical knowledge, it will be of immense service to them. Let them be perfectly honest in what they say of any appliance. It is far better to make a satisfactory sale, in all respects, than to complete a sale knowing that the appliance is not all that has been said of it, and giving rise to the probability of a consumer returning with complaints.

The Gas Consumer and his Needs.

Without unduly taxing your patience, I should now like to speak briefly of the public whose needs we are doing our utmost to supply.

The many uses of gas is far more widely known than it was a few years back. By means of advertisements, lectures, and last, but not least, competition, the public are pretty well informed as to its utility and reliability. Every time we read of a town in darkness, we immediately think that would not have happened had they used gas, and so on.

I think we may divide our consumers broadly into three sections. There is the ordinary household consumer, the tradesman, and the manufacturer or factory owner. The depths of the first two have been pretty well sounded by most gas undertakings. We have proved to them, and are still doing so, that gas is by far the the least harmful illuminant, and quite as efficient as any on the market, while being far more economical. We have also shown

them that for heating purposes, we are second to none, and that we can suit the shop, as well as the home, and render them warm, comfortable, and healthy.

For cooking and domestic purposes also, notwithstanding keen rivalry, we have not yet been beaten, and have no immediate prospects of other methods being able to cope with us on even equal lines, whatever they may do in the far-away future. Large laundries, hotels, and boarding establishments are also well catered for. But with the manufacturer, we have still a wide field before us. He needs light, heat, and power.

So far as light goes, we are holding our own. The high-pressure system of gas lighting meets the demands of the largest premises, and the most exacting consumer, and with an economy of gas. In the matter of heating, however, we are somewhat restricted by the regulations of the Home Office. In factories and workshops where there is no open chimney or vent, they have condemned the flueless gas-heater, which efficiently meets all the requirements of such premises. I think that it lies with us to place before the authorities the facts and tests in favour of these appliances, and persuade them to do justice not only to ourselves in this matter, but also the makers of the apparatus, and the consumers whose requirements it meets.

The Flueless Gas-Heater.

While the amount of carbon dioxide recognized by the Home Office as proportionate is twelve parts per 10,000, a flueless gas-heater does not add more than five parts of carbon dioxide to the atmosphere, which usually contains from four to six parts per 10,000. Therefore with the use of these radiators, the combined amount of carbon dioxide does not equal the amount stipulated by Government.

It has also been found that ventilation is materially assisted by the use of these appliances, in increased circulation of the air, and by the heat causing the impurities to rise quickly above breathing level. It often takes more gas to light the same apartment than it requires to heat it by a flueless radiator; and therefore it seems unreasonable to attack the one method and not the other, when gas is consumed under the same conditions—that is, by the bunsen burner. No matter what methods of heating are used, adequate ventilation is necessary, and it therefore rests with this method, as with any other, that proper ordinary means of ventilation are adopted.

Dr. Toogood in his experiments for infirmary heating came to the following conclusion: "That in large rooms, adequately ventilated, flueless gas-stoves can be used for heating without any hygienic disadvantages, the heated products of combustion (mainly carbon dioxide and water vapour) ascending quickly above the breathing level. . . . A ward or other public building in which gas radiators cannot be used with advantage, is improperly ventilated."

It is, of course, necessary that the radiators fixed shall be of modern pattern, and kept in proper condition; and an opportunity here presents itself to the canvasser, who may find one giving unsatisfactory results. Only under these conditions is it likely for the radiator to be found unsatisfactory.

One way in which we, in Glasgow, have met the requirements of the manufacturer labouring under the ban of the Home authorities, is by use of the gas circulator. Coils of pipe, or radiators in proportion to the rooms required to be heated, were run round the floor and ceiling, and, connected to gas circulators has proved a very efficient method. Where chimneys and vents exist, we have no difficulty in meeting the manufacturers' requirements in heating.

Gas for Power.

Gas power for industrial purposes is still a fertile avenue for our resources. I think our backwardness in this respect must be attributed largely to our lack of experience. It is a branch of industry that requires specializing; and I am strongly in favour of keeping an official solely for this purpose. A great deal of time, labour, and annoyance can be spared both the engine makers and the proprietors of the gas-engine, as well as the gas undertaking, if a man thoroughly conversant with the appliance can step in to advise and instruct. I have had experience of dissatisfaction lasting for months which could have been dispelled in less than an hour. In this instance, the complaint of insufficient gas supply drew my attention to the matter. It was proved repeatedly that the necessary gas was there, but to no avail, as the engine makers had been called in, and pronounced the engine quite satisfactory, and laid the blame on the gas supply. A certain suspected defect in the engine was pointed out; but, no, the makers insisted that all was right. At length the firm were induced to call in an independent and reliable party, with the result that the defect suspected was proved to exist. The engine was put right, and worked quite satisfactorily.

Gas-Furnaces.

I feel sure the gas industry is only on the brink of a great field of utility in gas-furnaces. We are expecting to do a much larger business in Glasgow with this class of appliance. For this purpose, we have set apart a room in our new workshops solely for them, and intend to test, experiment, and demonstrate. We have gas-furnaces already in use in such trades as glass-works, general engineering shops, tube makers, confectioners, bakers, tool makers, shipbuilders, &c.; and the past year was the first in which gas consumption for manufacturing purposes has exceeded that for power, although the latter has a substantial increase. We shall appoint a man who understands to pay periodical visits and see that appliances put on the district are working satisfactorily, to recommend others, and to generally exercise his energies in extending the sale of this apparatus.

Staff for New Business.

It is good also to organize a staff of canvassers for the general use of gas appliances. The district inspector has opportunities for recommending other appliances, and extending any order he may have in hand; but unless his district is very small, he has not the time to devote to actual canvassing, and at the same time maintain proper supervision of his men and work.

Canvassers can make new business without any reference to appointments or communications. They can watch new buildings and persuade the builder to run adequate gas-piping while the place is in course of erection, get in touch with architects and house agents, and obtain the names of new tenants, while pushing the sale of gas appliances in any other way that may open up to them.

Meter inspectors are also a class of men with opportunities for doing good. If they are promoted from among fitters, they are quite capable of advising a consumer whose house they may be visiting in the course of their duty, and who may make some complaint to them as an official of the gas undertaking. A report as to the complaint, and the nature of it, will expedite the remedying of it, without entailing unnecessary visits.

A few general rules to guide those engaged in the work of the sales and distribution department are:

1.—Work to a system, and keep an eye on even the trivial details. They sometimes develop into big results.
2.—Insist on good manners in all departments to all classes of individuals.
3.—Exercise forethought, and look ahead.
4.—Do not promise what you cannot hope to fulfil.
5.—You do more good to the industry by selling an appliance that does its work with little gas, than one that consumes a large quantity.
6.—Before completing a sale, endeavour to ascertain if the appliance is suitable for the purpose required of it, and if the conditions for working are satisfactory.

These two latter rules are most important. The success of a gas-fire depends greatly upon the fixing and working conditions, and the harmony of the room can be destroyed by an incongruous gas-fire in the grate. They also apply to gas hot-water circulators. If the existing installation is not suitable, the circulator will never give satisfaction until the defect is altered. It is necessary with both fires and circulators to see that they are equal to the demands made on them, but not excessive in their consumption of gas.

Gas Circulators.

The gas circulator is steadily forging to the front. In Glasgow, we have found it very adaptable. For instance, in bottling warehouses and public houses, we have fitted a large number of circulators, combined with a storage tank and supply cistern mounted on an angle-iron frame, screwed on at the back of tubs or wall of cellar. It has been found a most efficient and economical method of obtaining hot water. In public houses, by fitting a circulator and tank in the cellar, and connecting pipes to the pie heaters and sink at the counter, it has been found sufficient to give a supply of hot water for washing purposes and heating pies in a jacketed pie-heater.

Again, in greenhouses, the boiler for the heating pipes is frequently placed in most awkward corners, and the trouble has been the small size of the boiler, and the fire always going out. By connecting a circulator on to the existing pipes, it has been found more economical and efficient; and by placing the control cranes above the ground, the necessity of crawling on one's knees to stoke the boiler is obviated.

In modern-sized houses around Glasgow heated by radiators, the boiler for heating them has been placed in the basement of the house, and usually in awkward corners, and the trouble has been with the maids to get them to stoke and maintain an even temperature. By the use of circulators fitted in batteries, the temperature can be maintained at an equal level, at quite a reasonable cost, and all the extra labour of carrying coal and removal of ashes, with the accompanying dust, is abolished. I have already mentioned one instance where the circulator conquered the difficulty of maintaining heat, where the flueless gas-heater was condemned; and of its utility in the house for domestic purposes, we are all fully aware, and the public daily becoming more so.

The Need for Advertisement.

The series of winter lectures carried on under the auspices of the Smoke Abatement Society, and the advertisements of the British Commercial Gas Association, have been of assistance to the commercial undertakings of such towns where these are prominent; but much needs to be done by the undertaking itself. Wherever it is practicable, advertise. The public are even yet scarcely alive to the number, variety, and utility of gas appliances. This can only be remedied by advertisements and demonstrations. We want the public to be so familiar with gas that they will regard the house without a gas supply much as they would a house without a water supply, and the manufacturer to feel that his business is neither up-to-date nor efficiently equipped without the latest gas appliances.

DEVELOPING SALES OF GAS AND INCOME-TAX DEPRECIATION.

By J. B. Scott, of Cowdenbeath.

To the commercial man, there is nothing that appeals with more interest than the developing of his trade or business, and likewise the increasing of his profits; but the sequel to such development is increased taxation. I am not prepared to debate here whether our system of taxation is right or wrong. But we must admit that the more progressive and the more industrious and successful we become, the more taxes we have to pay; so that in the meantime it is our duty to make the best of existing conditions. Hence my reason for bringing this subject before you to-day, and adopting the title as above.

There are several ways in which we can promote our sales of gas, and, let us hope, increase our profits at the same time; but there are only one or two that I propose to deal with to-day, and, if they were adopted, how they might affect income-tax depreciation under the new scheme. I have no doubt you are all aware that fully a year ago representatives of the Inland Revenue Authorities and the principal gas companies drew up and adopted a scheme of depreciation whereby a more reasonable allowance would be given in lieu of wear and tear, and the amount of depreciation made easier to be arrived at between gas authorities and the assessor. Previous to the launching of this scheme, each assessor and each body of local commissioners had their own fads and fancies and ways of deciding matters; but now, if any gas company cares to adopt the new system, there is an end to all this. I think we are very much indebted to the Committee who fought so hard with the Inland Revenue Authorities, and brought the scheme to such a successful issue.

Free Slot Installations.

I propose to deal with the whole scheme; but before doing so, I would first of all address myself to the "one or two" methods of developing our sales. I would therefore now raise the subject of "Free Slot Installations." In the "Gas World" of Aug. 16, I noticed the number of free slot installations in this country put down as being 3,500,000. Frankly, I was amazed. One can scarcely imagine where they all are. I do not think Scotland, at least, contributes very largely to this grand total. But, be that as it may, this method of increasing our output is worthy of all the consideration we can give it, especially in towns and districts where large numbers of houses are still without gas-fittings. During recent years, my labours have been almost entirely confined to mining districts, and into several of them I have had to introduce gas supplies where previously no gas had been used, and, of course, no fittings installed. My experiences have proved the great difficulty that lies in getting landlords (whether they may be private individuals or companies) to supply and fix the necessary internal fittings. Why then, in these cases, should the gas authority not adopt free slot installations?

It is customary, in our district at least—and, indeed, in most districts—that where a slot-meter is being fixed the gas authorities lay the service-pipe, and supply and fix the meter and a griller or boiling-ring all free of charge, so why stop at the internal pipes and brackets? It really does not matter to the consumer who does the work. If the landlord does it, he raises the rent accordingly; and if the gas authority carry it out, they charge a higher rate for gas. Only in some cases the landlords are guilty of taking the advantage, and of raising the rents much higher than is necessary to cover the cost of gas-fitting; so that possibly the consumers as a rule would find themselves much better served by the matter being wholly in the hands of the gas authority.

Suppose we look for a minute at what the actual additional cost would be, including the internal fittings, for tenement properties and workmen's houses. I find the average cost of the service-pipe and the slot-meter, fixed, works out about £2 17s. each house. Add to this (say) 15s. for gas-fitting, &c., and 8s. 6d. for a griller and connection, and we have a total outlay of about £4 0s. 6d. per house. Had this been done with an ordinary meter and the landlord supplying the fittings, the cost to the gas authority would have been as near as possible £2. It would appear, then, that the slot installations cost £2 0s. 6d. per house more than houses fitted up in the ordinary way. Therefore the price of gas to such consumers would require to be based on a figure capable of repaying this sum in (say) ten years, with 5 per cent. interest. This would mean as near as possible 6s. per house per annum, or, taking the average consumption at 10,000 cubic feet per meter, the extra price required would be 7½d. per 1000 cubic feet. These prices are based on current rates of material and labour; and we all know that at present these form a serious handicap to the development of the gas industry. At former prices of materials, 5d. or 6d. per 1000 cubic feet would be ample to cover all extra outlays.

The extra charge for gas through the slot-meter varies, but is usually about 5d. per 1000 cubic feet. So that if an additional charge of 1d. or 2d. were made, we could adopt such a free-fitting policy, which would greatly increase our business, and at the same time bestow a boon upon many householders who are at present non-consumers of gas. I should possibly mention here that if the consumption is less than 10,000 cubic feet per meter, a corresponding extra rate would be required. Suppose I put it in this way. Take from your profits the sum of £5, and with this borrow £100. With the £100 we could pay the extra cost of slot installations on fifty houses. These fifty houses should yield an increased sale of 500,000 cubic feet; and the gross profits from this sale should at least reach £40, with which the usual capital charges would be paid. But later I want to show you where an amount equal to more than the first year's interest can be saved by adopting the new scheme of income-tax depreciation.

Before leaving this, there is another point I would like to mention. Some companies are inclined to debit a charge against slot-meters for extra cost of collection and attention. I do not agree with this. Slot sales are—or, at least, should be—treated as cash sales; and I think we owe the slot consumer something for paying his gas in ready money. My plan is to let the one stand for the other. Again, assuming that slot sales are cash sales, I am in favour of collecting from the meters at least six times a year; and, by doing so, the sales will be increased and the bank account kept more healthy. The better the circulation of copper, the better will be the slot sales, and the less chance of smaller losses from burglaries.

Hiring and Maintenance of Outside Lamps.

Another subject I might mention is the hiring and maintaining of outside lamps for shop lighting. If shop lighting is to be the success it ought to be, then it should be entirely in skilled hands. Many years ago I arranged with the business people of our town to overhaul and clean all their lamps free of charge, excepting, of course, for mantles and glasses. But a difficulty arose here by some of them fitting cheap and inferior lamps. To get over this, I now fit up lamps complete, and maintain them with everything excluding gas, at so much per lamp per annum. I base the hire or charge so that the lamp will be repaid in five years, with the cost of mantles, &c., included. For a lamp of the value of £2 fitted up, I get 15s. per annum; and many of our consumers are enamoured of this contract system, as it relieves them of the trouble and responsibility of attention, while in five years' time they can have another new lamp of the latest design without any payment of a capital sum.

There are other ways and means of developing our sales; but seeing there are two papers more to-day dealing with subjects very similar, I will leave off at this point and revert to

The Income-Tax Depreciation Scheme.

For many years past, the Inland Revenue Authorities have adopted the principle of assessing for income-tax at the source of production. That is to say, in the case of gas companies they assess the company direct, and not each individual shareholder. The company, of course, have the right to deduct such taxes from the dividend paid to shareholders; hence the reason why we frequently see dividends declared at so much per cent., less income-tax. Should any individual shareholder have an income less than £160 per annum, he has the right to reclaim from the Inland Revenue Authorities the sum which the gas company deducted for income-tax from his dividend; but he cannot reclaim from the gas company. In some cases the company pay dividends free of income-tax, and they can do so if they care to. It is only another way of giving an extra half per cent. dividend. What we, as gas managers, have to deal with then is—On what sum are we to pay income-tax for this year? I say this year, because each year forms its own basis.

The different ways in which each company makes up its own accounts have to be taken into consideration in arriving at the sum; but it is usual to commence with the income side of the accounts. From the whole income, however derived, we deduct all the working expenses; such as coal, wages, salaries, rates, insurance, &c., but not such items as depreciation on works and plant, renewals, extensions, feu-duties, income-tax, interest on loans, or any other item that is really not an ordinary working expense. Then we have left a balance showing what the assessor would say is our assessable amount, less the wear and tear depreciation allowed under 41 and 42 Vict. 15, section 12 (Inland Revenue Act, 1878). The reason why depreciation written off works and plant is not allowed is because it is paid out of the profits of the concern; and the same applies to any renewals or extensions that may have been paid out of revenue. Feu-duties and income-tax are not allowed because we deduct the income-tax when paying feu-duty and dividends, and the same applies to interest on loans.

So far we meet with very little trouble. But now we come to the question of deduction for wear and tear; and, as the Act puts it, "the Commissioners shall . . . . allow such deductions as they may think just and reasonable as representing the diminished value by reason of wear and tear during the year of any machinery or plant used for the purpose of the concern."

You will see, therefore, that the whole power of fixing what may be "just and reasonable" lies in the hands of the Commissioners; and they in turn are no doubt guided by the assessor. How, then, are we gas managers to get what we consider "just and reasonable"? We may appeal and argue as we care; each set of Commissioners has its own system fixed, and simply will not alter it. In one district I was allowed 2 per cent. depreciation on main-pipes; in another I was told by the chairman of the Commissioners that they did not do this—they would allow renewals instead; and so on.

Generally, the rates allowed are: On plant and machinery, 2½ per cent.; on gas meters, 3 per cent.; on gas-stoves, 5 per cent.; and on main-pipes, 2 per cent. So that it takes 40 years to wipe off the first cost of plant and machinery, 33 years fully for meters, 20 years for stoves, and 50 years for main-pipes. To arrive at

the value of each of the different heads enumerated above, we commence with the first or original cost, *plus* any additions that have been made from time to time, less all wear and tear allowances that have been granted under these different rates of depreciation. I am sure you will all agree that these rates of allowance are very low indeed, and that much of the original plant, &c., would be worn out long before it had been fully allowed for. And it should be noted that no renewals whatever are allowed so long as these deductions are made. Briefly, that is the way in which the Assessors are working under the Finance Act of 1878. But now let us look at what we get under the new scheme.

This scheme is not an Act of Parliament, neither does it supplant any Finance Act; it is only when a gas company desires to adopt it, and to be assessed under it, that the Act is put on one side and the scheme adopted as an alternative. I should also say here that it is only available for gas undertakings other than municipal; so that corporation gas-works cannot so far adopt it. I hope, however, that managers of municipal gas-works will join in the discussion, as I have no doubt they in turn will be looking to improve their position along similar lines.

Paragraph 1 says—

PLANT, MACHINERY, AND MAINS.

> No depreciation shall be allowed in respect of the plant, machinery, and mains, other than as specified hereinafter; but in lieu thereof all expenditure on repairs and renewals is to be charged in the company's accounts for income-tax purposes and allowed as working expenses, as and when incurred. All expenditure on extensions and improvements, where debited against revenue, to be distinguished and excluded from the said allowances.

That is to say, instead of getting 2½ per cent. depreciation, we are to get all repairs and renewals. Suppose we renew a complete retort-bench which cost originally £500, we would receive the whole £500 as a deduction as and when renewed. The same applies to any other piece of plant or main-pipe. But if we extend or improve it, and charge such work to revenue, then the sum will be excluded from the allowance; and it is quite fair that it should be so. Also, if any depreciation has been allowed in former years under the old method, this sum too will be excluded.

Paragraph 2 says—

> Provided that whenever any expenditure on such renewals is incurred, and full effect cannot be given to its deduction in the year when incurred, owing to the profits or gains chargeable with income-tax in such year being less than the amount so expended, the balance of the said expenditure, which has not been allowed, may be carried forward and allowed in the following year or years, as is provided in the case of unallowed wear and tear by section 26 (3) of the Finance Act, 1907.

This paragraph is quite plain, and needs no comment—only that some year, if we had a very large renewal bill, we might clear, or more than clear, ourselves of income-tax altogether, and the balance (if any) be carried forward to our credit.

Paragraph 3 says—

GASHOLDERS.

> In addition to repairs, depreciation shall be allowed at the rate of 3 per cent. per annum on the written-down value. Such value not to include tanks, except where constructed of steel or iron, and in no case is the cost of excavation to be included in the value upon which the depreciation allowance is computed.

I think this a most reasonable decision. We are not likely to renew gasholders; so instead of classing them along with the other plant, we get 3 per cent. depreciation. This means that in 34 years or so we have been allowed the full cost of the holder.

Paragraph 4 reads—

METERS (ORDINARY AND PREPAYMENT), COOKERS, AND GAS-FIRES.

> In addition to repairs, allowance for depreciation shall be granted at the rate of 10 per cent. per annum on the written-down value.

This is a more reasonable allowance than under the old *régime*. To have 10 per cent., instead of 3 and 5 per cent. respectively, is surely a great advantage; and ten years is quite long enough to wait on subjects such as meters, stoves, and gas-fires.

Paragraph 5 says—

SERVICES AND FITTINGS.

> No depreciation shall be allowed in respect of services and fittings; but in lieu thereof all expenditure shall be allowed as a trading expense as and when incurred.

This is a very important allowance. All expenditure shall be allowed as a trading expense. Even should we charge these items direct to capital account, they are still a deduction for income-tax purposes. This is where free slot installations and free fitting come in. As I mentioned before, suppose in any one year we spend on such work (say) £100, we are saving in income-tax one hundred times 1s. 2d., equal to 6 per cent. on the amount spent—more than enough to cover the first year's interest.

For a progressive gas company who are spending a large amount of money on meters, stoves, fires, services, and free gas-fittings, and generally developing their business, I think that the scheme a splendid one, and especially the last two clauses. It certainly does not appeal in the same way to gas companies who are not developing on these lines; and possibly it may suit them to stick to the old way of assessment.

Then follow some general remarks and conditions in connection with the scheme, the principal of which are paragraphs 9 and 13. Paragraph 9 says—

> Where renewals are allowable under this scheme in lieu of depreciation, they shall be allowed notwithstanding that the cost thereof may not have been debited in the company's accounts against revenue.

Paragraph 13 says—

> Where, in any case, allowances for depreciation have been made which are now to be discontinued, and they have not been exhausted by renewals already effected, the amount of such unexhausted allowances shall be deducted from the expenditure on future renewals as and when they are effected.

FORM A.—*Showing Method of Assessment under the Finance Acts.*

Total receipts		£7636
,, expenditure		4758
		£2878
Add items not allowed—		
Depreciation written off	£227	
Renewals to plant, &c.	107	
Taxes and feu duties	158	492
		£3370
Less interest on overdraft	£175	
,, items separately charged	129	304
		£3066
Less depreciation in lieu of wear and tear under Finance Act of 1878 on written-down value—		
Plant and machinery, £9013, at 2½ per cent.	£225	
Main pipes, £7284, at 2 per cent.	146	
Meters, £4703, at 3 per cent.	141	
Stoves, £3499, at 5 per cent.	175	687
		£2379

FORM B.—*Showing Method of Assessment under the New Scheme.*

Total receipts		£7636
,, expenditure		4758
		£2878
Add items not allowed—		
Depreciation written off	£227	
Taxes and feu duties	158	385
		£3263
Less interest on overdraft	£175	
,, items separately charged	129	
,, cost of new services and fittings	173	477
		£2786
Less depreciation in lieu of wear and tear under new scheme on written-down value—		
Gasholders, £2775, at 3 per cent	£83	
Meters, £4703, at 10 per cent.	470	
Stoves, £3499, at 10 per cent.	350	903
		£1883

Let us assume that all previous depreciations allowed on plant, machinery, and mains amounts to £5000, and renewals carried out and disallowed for income-tax purposes amount to £3900, there is still a balance of £1100 to be wiped-out under paragraph 13. So that the £107 spent on this account will go to reduce the £1100; and so on each year until it disappears altogether. Therefore, the £107 is disallowed, and has to be added to the £1883, making the assessable amount £1990, which still shows a difference of £389 in favour of the new scheme.

Now that the method of arriving at our income-tax valuation has been determined in a satisfactory way, one would wish to see the valuation of gas-works under the Poor Law Act for rating purposes in the same position, and instead of three separate Acts ruling for England, Scotland, and Ireland, as at present, that one common law should dominate the whole.

FREE GAS APPLIANCES.

By DAVID VASS, of Perth.

Few persons nowadays will question the wisdom of gas undertakings making it easy for their customers to have the use of a gas cooking-stove. With some undertakings, this is attained by a rental sufficient to cover the charge on the capital outlay; but the general experience that easier terms increase the popularity of the cooker, and bring a return of profit far in excess of the capital charge, has induced many concerns to reduce the rental below that figure, and in not a few cases to abandon entirely rental for cookers. This experience with free cookers has been so favourable to gas undertakings that some have now extended the principle to other than cooking appliances; and it is with the idea of having the argument for and against the principle focussed, that it has occurred to me to bring forward the subject at this time.

The question to decide first may be stated thus: Is a concession by (1) reduced rental, (2) free use of apparatus, or (3) reduced rate of gas for domestic purposes, other than lighting, justifiable and desirable? A concession is desirable, in that it aims at inducing increased gas sales, both by increased use of present apparatus and introduction of new business. It is justifiable so long as it shows a profit in excess of the cost of introduction and maintenance. A reduction in rate of gas involves the difficulties attendant on a differential rate; and for this reason I would give it third place. As between (1) "reduced rental" and (2) "free use," it is to some extent a matter of degree. But my

experience is that where there is a rental, however small, some consumers get it into their heads, in the off-season, that they are being called upon to pay for something of which they are not getting full value, so that total abolition of rental reduces the demand for exchanges and creates a better feeling—in fact, tends to increase the service of the apparatus.

In the case of gas undertakings which have come more directly under my notice, the rentals received from cooking-stove hires were only equal to one halfpenny per 1000 cubic feet of gas sold, and it is very unlikely that rental from other appliances would ever bring in anything approaching this figure. But even assuming the same figure, the abolition of such rental is surely a very small concession to grant in order to draw and encourage business on lines which may be more a luxury than a necessity to the household; for unless there is some inducement and persuasion and push used in the introduction of this class of business, the business will be non-existant.

The system in use under the Perth Corporation is to supply and fix all domestic gas apparatus free, under a guaranteed minimum consumption for each apparatus. The scale is 1000 cubic feet for every 10s. of net cost of apparatus and fixing—*i.e.*, for every 10s. of capital outlay; the consumer being bound to pay a surcharge of 1s. per 1000 cubic feet for any quantity short of the guarantee. In this way, the consumer guarantees that the appliances in use will not be a burden on the undertaking, as the profits on the guaranteed consumption or the surcharge will be sufficient to return 10 per cent. on the outlay.

The appliances given out under this guarantee comprise:

A 1.—Gas cooking-stove (any size up to No. 5).
A 2.—Boiling-ring.
A 3.—Griller.
B.—Hot-plate.
[One only of above to each house.]
C.—Scone baking-plate.
D.—Gas-iron or set irons and stand.
E.—Wash-boiler.
F.—Water-heater (various).
G.—Geyser.
H.—Gas-fires (various).
J.—Gas radiators.

A periodical inspection of all apparatus on loan, whether free or rented, is an essential (but more particularly where it is free), to see that the apparatus is in good working order, and not allowed to fall into disuse. In connection with our survey of appliances, an inspection card has been prepared for each consumer showing the list of appliances in use and the quantity guaranteed, so that it may be possible to arrive at the surcharge (if any).

We have recently made some experiments with a view to ascertaining what period would be required from each apparatus in order to ensure the guaranteed quantity; and the following table gives our results.

Apparatus.			Average Cost, including Gas-Fitting.	Guaranteed Annual Consumption.	Average Hourly Consumption.	Required Service per Annum.	Probable Average Service per Annum.		
—	Name.	Type Used in Test.	s. d.	Cub. Ft.	Cub. Ft.		— Hours.	Quantity. Cub. Ft.	Details.
A^1	Cooking-stove	No. 2	48 0	5000	..	5000 c. ft.	..	12,000	400 c. ft. per week for 24 weeks 100 ,, ,, ,, ,, 24 ,,
A^2	Boiling-ring	5-inch	3 8	500	10	50 hrs.	700	7,000	2 hrs. per day for 350 days
B	Hot-plate	Grill and ring	14 6	1500	13·3	113 ,,	1050	14,000	3 ,, ,, ,, ,, 350 ,,
C	Baking-plate	16-in. × 16-in.	15 8	1500	18	83 ,,	72	..	1·5 ,, per week ,, 48 weeks
D^1	Gas-iron	Stand	10 2	1000	5·5	182 ,,	96	528	2 ,, ,, ,, ,, 48 ,,
D^2	,, ,,	Internal heating	10 10						
E	Wash-boiler	12 gallons	50 4	5500	60	92 ,,	96	5,760	2 ,, ,, ,, ,, 48 ,,
F^1	Water-heater (used for bath)	10 ,,	56 4	6000	30	200 ,,	192	5,760	4 baths ,, ,, ,, 48 ,,
G	Geyser	Ewart's "Victor"	63 0	6500	90	72 ,,	64	5,760	4 ,, ,, ,, ,, 48 ,,
H^1	Fire (in sitting-room)					143 ,,	900	18,900	6 hrs. per day for 150 days
H^2	,, (in drawing-room)					143 ,,	180	3,780	6 ,, ,, ,, ,, 30 ,,
H^3	,, (in dining-room)	10-inch	30 0	3000	21	143 ,,	450	9,450	3 ,, ,, ,, ,, 150 ,,
H^4	,, (in bedroom)					143 ,,	300	6,300	2 ,, ,, ,, ,, 150 ,,
H^5	,, (in guest's room)					143 ,,	30	630	2 ,, ,, ,, ,, 15 ,,
H^6	,, (in office, &c.)					143 ,,	1050	22,050	7 ,, ,, ,, ,, 150 ,,
H^7	,, (in sitting-room)					150 ,,	900	27,000	6 ,, ,, ,, ,, 150 ,,
H^8	,, (in drawing-room)					150 ,,	180	5,400	6 ,, ,, ,, ,, 30 ,,
H^9	,, (in dining-room)	14-inch	41 3	4500	30	150 ,,	450	13,500	3 ,, ,, ,, ,, 150 ,,
H^{10}	,, (in bedroom)					150 ,,	300	9,000	2 ,, ,, ,, ,, 150 ,,
H^{11}	,, (in guest's room)					150 ,,	30	900	2 ,, ,, ,, ,, 15 ,,
H^{12}	,, (in office, &c.)					150 ,,	1050	31,500	7 ,, ,, ,, ,, 150 ,,
J^1	Gas radiator (in vestibule)					929 ,,	1200	8,400	10 ,, ,, ,, ,, 120 ,,
J^2	,, ,, (in shop)	6 loop, 32 in. high	60 9	6500	7	929 ,,	1000	7,000	10 ,, ,, ,, ,, 100 ,,
J^8	,, ,, (in church hall)					929 ,,	160	1,120	8 ,, per week ,, 20 weeks
F^2	Water heater for bottle-washing	10 gallons	56 4	6000	30	200 ,,	100	3,000	2 ,, ,, ,, ,, 50 ,,
F^8	,, for lavatory basins	Fletcher's coil	40 3	4000	16	250 ,,	520	8,320	10 ,, ,, ,, ,, 52 ,,

The cooking-stove, comprising as it does a number of burners, cannot be readily tabulated alongside the other appliances, and a separate test was made from actual use, extending over a period of eighteen consecutive days in the month of August. The cooker was a No. 2 size; and the whole cooking for a family of three adults and two juveniles averaged 400 cubic feet per week. Taking (say) 24 weeks in summer at this rate, and 24 weeks in winter at 100 cubic feet per week, we have a consumption of 12,000 cubic feet per annum, as against the required guarantee of 5000 cubic feet.

A review of the table will show that the items in which the probable service does not come up to the guarantee are few in number; the only outstanding ones being the gas-fire in guests' bedroom (H^5 and H^{11}) and the gas radiator in Church hall (J^8). With reference to the former, it generally happens that the consumer has other appliances using gas in excess of the guarantee; and as all the supply is measured through the one meter no surcharge would fall to be made. In the case of Church hall, &c., we make it a point to give an estimate of the probable surcharge at the time of introducing the radiator, to obviate any difficulty on this score. It is, therefore, very questionable if it is at all advisable to raise the question of surcharge for any of the appliances other than the gas radiator already referred to.

I hardly think I need to emphasize the point that increased sales, even if they are below the full selling price, but well within the paying line, are desirable in every concern, and more particularly in towns where the population is not now growing, and where there is no immediate expansion of industrial activity in view. Under such circumstances, it is almost a necessity to look out for a field for expansion of business, in order, by increased manufacture, to bring about a cheapening of production.

You will observe that the question I have raised relates to apparatus for domestic use. We admit the advisability of a special rate for commercial and industrial purposes; and in Perth there is a very liberal scale for this class of business when measured by a separate meter.

In the case of smaller supplies required for industrial purposes, where it will not pay to introduce a separate meter, they can have the use of apparatus on the same terms as for domestic use, but only such apparatus as comes within our list of domestic appliances is given out on these terms.

DISCUSSION ON THE THREE PAPERS.

Mr. A. Masterton (Edinburgh) complimented Mr. Halkett on his paper. The author had, he said, put before the meeting in a lucid manner the many problems which the distributing engineer had to meet day by day; and he (the speaker) felt sure that, if Mr. Halkett's advice and suggestions were acted upon, the result would be of great benefit to the gas industry. With regard to the card system, they had had it in operation in Edinburgh for some years; and it was their practice to keep on the cards all the appliances fitted in the various houses, and also details of the attention and repairs they required. The only thing about the method was that it involved a very considerable amount of clerical work, which required to be done with great accuracy to make it of any use. With regard to apprentice gas workers, he was sure they had also carried out this principle in Edinburgh for a good many years. The unfortunate thing was that they found, when the term was served, that most of the apprentices desired to be put on to the clerical staff and taken altogether away from the handling of tools. The fact was that they had experienced great difficulty in getting young men to become apprentice gas workers. He had been putting advertisements in the daily newspapers for months past, and had only received two replies, neither of which was satisfactory. Then, again, they required to take stern measures to get the young fellows to attend evening classes at all. In fact, they guaranteed their fees, and offered inducements—adding to the wages of those who got certificates at the evening classes. In respect of their pay, he thought they would admit they were treated generously. They commenced with 7s. 6d. a week in the first year, and went on increasing to a minimum of 18s. a week; and this, of course, could be increased to 21s. if the boys were in any way diligent. The next point he should like to speak of concerned the plumbers and private traders.

They had experienced a great deal of opposition from them; and they had come to an agreement whereby they were allowed to fit in fires and other heating appliances at scheduled rates, but on consideration that they encouraged the use of gas by direct recommendation, and also by exhibiting appliances in their windows. So they had got over this trouble. For some months, they in Edinburgh had been sending out a periodical published by the British Commercial Gas Association entitled "One Thousand and One Uses for Gas." By this means, they had had a good many inquiries. He commended Mr. Halkett's paper not only to all gas managers, but to attendants in show-rooms and all others engaged in the distributing system.

Mr. WALTER GRAFTON (Glasgow) said the subject was how would it be possible to get consumers to burn gas as freely as they did a decade ago. The policy of supplying free meters, free cooking appliances, hire fires, &c., was to encourage customers to use them, not for ornament, but to do useful and satisfactory service in their several positions in the home or place of business. In this connection, he might here give some comparisons between 1902 and 1912 in reference to Perth, Dundee, and Glasgow. In Perth, in 1902, the gas made was 181,090,000 cubic feet. The number of consumers was 8800; the price of gas was 3s. 2d.; and the consumption per consumer was 20,580 cubic feet—a money value of £3 5s. 2d. In 1912, the make was 240,914,000 cubic feet, the number of consumers 14,047; the price of gas 2s. 8½d.; and the consumption per consumer 21,800 cubic feet—equal to £2 19s., or a decrease in the decade of 6s. 2d. In Dundee, in 1902, the make was 658,052,000 cubic feet; the number of consumers 46,324; the price of gas 3s.; and the consumption per consumer 14,200 cubic feet—equal to £2 2s. 7d. In 1912, the Dundee figures were: Annual make 946,796,000 cubic feet; number of consumers, 48,063; price 2s. 1½d.; the consumption per consumer 19,700 cubic feet—a decrease in revenue of 1s. 7d. While Perth had increased the consumption per consumer by only 1220 cubic feet and reduced the bill by 6s. 2d., Dundee had increased the consumption by 5500 cubic feet and reduced the amount by only 1s. 7d. In the same decade, the consumption in Glasgow per meter had fallen greatly. Comparing 1902-12 and 1903-13, there had been decreases in the bills of 14s. 6d. and 15s. 3d. respectively. Had the consumption per meter been maintained, the total consumption during the last year should have been 17 per cent., instead of only over 7 per cent. One reason for the falling off in the volume of gas registered per meter was the fact that gas suppliers were installing meters whose capacities were far too small to adequately register and pass all the gas that some consumers would use, and really required to use; but the tap being full on, there was no adjustable storage volume before the tap. Too many of the smaller sizes of prepayment meters—as two and three light ones—were being put into positions where five lights should be fixed. This no doubt, in a more marked way, applied to ordinary meters. Instead of two and three light meters, five lights, and also ten lights for five lights, should be fixed. Say a consumer had a three-light meter, and had a fire installed in addition to a cooking appliance, the result was that the fire was unsatisfactory; it gave no heat, &c. In fact, every "gas-burner" in the house was condemned or the gas was said to be "rotten." The other reason was pressure. Flat-flame burners required no pressure beyond 10-10ths; whereas mantle-lighting burners, cookers, and fires needed more than double this pressure. But as many of the fittings were of old-date size, and the meter too small, 40-10ths pressure was really not too much to ensure satisfactory results in one and every case. Of course, it must be understood that this pressure was only in the mains, and not in the pipes of the houses where gas was being used.

Mr. S. MILNE (Aberdeen) said it was a remarkable fact that all the papers had dealt with the distribution of gas. It brought home to their minds how important the matter was. The gas-fitters had received a great amount of attention from gas engineers. He was afraid they would become "swelled-headed" and that they were expecting too much of them. After all, they required a superintendent with a good, level head—a man of constructive genius. If he had good, practical men under him, it was well. While it was very important that the fitter should be trained, it was the superintendent they had to apply their attention to. In connection with the interesting questions raised in Mr. Vass's paper, he would give his experience in Aberdeen. Recently they had introduced free cooking appliances. They did not believe in giving out boiling-burners, which were not worth the time of putting up. They gave grillers and cookers and bakers' hot plates. In 1911, the increased make over the previous year was 23¼ millions. In October of that year, they had a gas exhibition, and simultaneously with this they introduced free cooking appliances. It was found, at the end of the financial year, that they had increased 45 millions, or 5·84 per cent. But for 1913 the increase was 84 millions, or 10·32 per cent. Reporting to his Committee, he had forecasted that within three years the consumption would probably go up 120 millions. In two years, however, this increase had been obtained. So far as Aberdeen was concerned, free cooking appliances had been justified. They had not, however, gone so far as Perth in the matter. They had not yielded to the free fire system; nor, with his present knowledge, did he recommend it. Gas-fires, geysers, and such things were, after all, at present luxuries, though the day would come when they would be necessities. Take a gas manager who did not get his gas-fires as a perquisite to his salary. Ask how often he used his gas-fires. The answer would be "As seldom as possible." They might judge the general public from themselves. Those who were going in for gas-fires should make up their minds upon the series of fires which were going to suit them. They should not have anything to do with porcelain fires. The suggestion had been made that there might be a reduced rate for gas for cooking. This, however, would necessitate two meters. He did not think they should shut their eyes to the fact that gas lighting was the backbone of their existence. They would be penalizing the lighting consumer by a reduction for cooking and heating. They should encourage by all means in their power the consumption of gas, in order to bring down the general price; but let the lighting consumer have any advantage that was going. He was "up against" the free geyser business more than anything. Mr. Vass had given a price; but what about the painters and plasterers, who had to do the room up after the installation? How did Mr. Vass get over this? In regard to lavatory water-heaters, he had one; it was convenient, and was used four or five times a day by himself and staff. He did not believe they would have a consumption for two hours a day. He thought other points could be brought forward to indicate that Mr. Vass had taken too rosy a view of the average service per annum.

Mr. R. G. SHADBOLT (Grantham), dealing with Mr. Scott's paper, remarked that he would like to say, as one of the Committee who came to the arrangement at Somerset House, that he did not think anyone could have presented the matter in a better or more lucid form than Mr. Scott had done. He should like to emphasize one point for anyone hesitating to claim depreciation owing to being in doubt as to whether or not he should accept the arrangement that had been made. If the manager were to claim on every item to which he was entitled, and made a series of claims, he had to claim to separate Commissioners, and each body of Commissioners was "a law unto itself," and no force could compel them to reveal the basis upon which they gave their judgment. It was advisable that any company hesitating should accept the arrangement. If they had waded through all the negotiations, he thought they would agree with the Committee that they made a very good bargain. But he would like to express his surprise at the very humble manner in which corporations had brought forward claims. He imagined that if the municipally-owned undertakings cared to approach the authorities they might obtain what was desired.

Mr. J. W. NAPIER (Alloa) referred to the statement of the last speaker that corporations did not obtain the reductions. It was a fact, however, that, so far as corporations in Scotland were concerned, they had all along obtained certain reductions. Percentages were being obtained at the present time. Possibly the speaker's references were to English undertakings. The Scottish institutions had been thoroughly alive to this matter. It had been a question of extreme difficulty for him to determine how far it was desirable and commercially practicable to give out appliances free—appliances other than gas-cookers. The sentiments expressed by Mr. Milne were perhaps characteristic of the Aberdonian, in so far as cautiousness might be an element which might defeat its own ends. He was driven to this conclusion, that unless gas authorities made up their minds to give gas cookers, fires, geysers, &c., under other conditions than requiring to buy them outright, it would not be possible for the public to make use of gas as a heating agent to the extent that gas was worthy of. In the matter of gas-cookers, one had an appliance that was applicable to every household of every class, and one which was absolutely necessary in these days of labour saving. In the case of gas-fires, they had conditions that were different. In the drawing-room and the bedroom, gas-fires were used intermittently. Now, if they were going to obtain a great gas consumption, were they going to stand still and insist upon the public paying for these appliances, and therefore lose their gas consumption? It seemed to him that the free system, despite the fact that it did not appear commercially profitable in certain instances, would, on the average, be quite practicable and advantageous from a commercial point of view for gas authorities. The time would come when gas departments would lend out gas appliances of all descriptions, whether gas cookers or fires. With regard to the ideas of Mr. Vass, he would like to know if the Perth Corporation were satisfied that his policy was a correct one. He (Mr. Napier) was a believer in the law of averages. They all knew that there were many gas consumers through ordinary meters who did not yield them a profit. In many instances, there was actual loss, yet none of them would seek to deny these gas consumers a supply of gas. He believed in this conception that the time would come when, in the simple law of averages, gas authorities would be obliged to give all appliances, of whatever nature, free to the consumer.

Mr. HUBERT POOLEY (Leicester) criticized the Council's method of taking the discussions on the papers together. Continuing, he said it was some years since he had been President of the Association, and it was with the greatest pleasure he was there that day. In Scotland, he might claim to be one of the pioneers of the gas-cooker business, and one of the first to introduce prepayment installations—in Dunfermline. As to the question of gas-cookers and free cookers and appliances generally, it was his opinion that it was one for each individual town to regard differently. The matter could not be decided for all places on similar lines. In the case of Mr. Vass at Perth, he ventured to suggest his was not a free scheme. Under it, he must have a guarantee or else a guaranteed rental. Referring to Mr. Halkett's paper, he

thought the question of the education of the gas-fitter and his promotion to an inspector's position was a very difficult one indeed. They had for many years carried out this in Leicester, and had had a measure of success. But they found men entering the fitting department deliberately with the view of becoming inspectors. Senior fitters might have been so long at the bench that they had actually forgotten a good deal of the arithmetic they had learned, while the junior fitters did not attend evening lectures except under compulsion.

The PRESIDENT expressed his indebtedness to the readers of the papers. He could not quite agree with Mr. Milne in not giving out boiling-rings. If one got a gas consumer to use a fair amount of gas at a capital expenditure of 9d., it was a pretty safe line of business. When he came to Greenock, he found there were nothing but high-grade cookers used; and the average capital invested per consumer had very much dropped since that time. He was sure Mr. Vass did not insist upon a guarantee. He had a guarantee in his system of free cookers, but had never insisted upon it. He must confess himself as being one of the "back numbers," along with Mr. Milne. He did not feel sure on the point of giving out gas-fires free.

Mr. HALKETT, in reply, admitted that the card system entailed a considerable amount of work. But he was thoroughly convinced that he was justified in keeping a good record, and that it would not be too expensive. He had the experience of seeing the card system initiated in England, and brought up to a state of efficiency. It was well to have full details of everything that was going on. In Glasgow, they had only had the system for a short period; but it was working wonderfully. As to apprentices, in the North there was a difficulty in obtaining them; but in the South, there was not the same trouble. He could only account for the scarcity in the North by the fact that there were better inducements elsewhere—especially in shipbuilding, in which some of the lads made a man's pay in a short time. In Glasgow, they were the best of friends with the private traders. They were always paying them a considerable amount of money. In the nine months from October to July, they had fixed 3000 cooking appliances and 12,500 fires; and the private firms did a considerable amount of this work for them. They had also issued a notice to the building trade with regard to a constructive scheme. Not only had it been beneficial to them, but it had drawn the builders nearer to them. With regard to Mr. Milne's assertion that the gas-fitters were being made too much of, they must recognize that this was a class of men coming into direct contact with the consumers; and help from them meant much. He thought he had emphasized that they also had a dearth of officials to take responsible positions. Too many had been put into positions without sufficient training. If a superintendent were to hold command of a department, he should have had a certain amount of practical training.

Mr. SCOTT thanked Mr. Shadbolt for his remarks—especially as he had so much to do with the carrying through of the scheme which had been the subject of the paper. In connection with the 10 per cent. depreciation, he could see a point that had been raised by Mr. Vass. Ten per cent. really did not amount to the capital sum being returned in ten years. It might take twelve or thirteen years; but still they got it. It was a great deal more than he had been able to obtain under the old system.

Mr. VASS, in reply, explained why Perth was going on the new lines. If they had an increase of 10 per cent. per annum, as they had had in Aberdeen, they might have rested upon their oars. The new way gave sufficient encouragement to make them go forward. He would point out to Mr. Milne that the price for fitting-up water appliances did not include the plumbing and plastering work. The consumers themselves had to provide this; and it often entailed a very considerable sum. The service for a lavatory basin was taken from a barber's shop. The question had been raised as to whether they would benefit from free fires and free appliances. In Perth, they were finding that it was necessary to make an alteration in the price of gas. The question was whether they should return to rentals. He did not think they would have been justified in going back to rentals for gas-fires, because he must confess that in 98 per cent. of cases the fires paid them. Cooking appliances paid them "hand over fist." As to the question of the application of a guarantee. It had not been applied hitherto. But it was one of the conditions he had in mind when setting the scheme afoot. From his own experience he thought the guarantee was unnecessary.

A NEW FIRE FUEL.

Though the first object to be kept in mind in the designing of gas-fire fuel is its efficiency as a means for radiating heat, the question of appearance is also one that is certainly of importance. That this is a fact which has been generally recognized by the stove manufacturers will be admitted by those who have made themselves familiar with the modern fire; and it is therefore with no surprise that one learns that efficiency and appearance have been equally borne in mind in the production of a new fuel to which attention has just been drawn. The designers of this fuel are Messrs. Wilsons and Mathiesons Limited, of Armley, Leeds; and, on their invitation, the writer has been afforded an opportunity of seeing samples of it in use at their London show-rooms, in Queen Street, Cheapside. The fuel was obviously of great radiating capacity, and was both quickly and evenly heated There was no reason whatever for challenging the statement of the firm that it gives increased radiant efficiencies of from 10 to 20 per cent.—this claim being based on actual tests. As regards appearance, there is no hesitation at all in saying that the new fuel, whether the fire be hot or cold, is pleasing to the eye; and consumers will like it. It may therefore be confidently expected there will be a good demand for gas-fires in which it is fitted.

Wilsons and Mathiesons' New Gas-Fire Fuel.

A good idea of the novel formation of the fuel will be gathered from the accompanying illustration, which gives a side view of a single piece; while from the second illustration will be seen that, when a number of pieces are assembled in a gas-fire, the appearance of a continuous trellis-work covering the fire-front is produced. The fact that each piece of fuel is constructed with a substantially solid back prevents excessive loss of heat through the fire-brick back, thereby giving increased radiating efficiency. Equal thought has been expended over the construction of the top fuel, which harmonizes with the pattern of the upright pillars, and at the same time is so formed that the products of combustion are directed towards the flue outlet—thus ensuring the hygienic perfection of the fire.

COKE AND RESIDUAL PRODUCTS MANUFACTURE IN BELGIUM.

The manufacture of coke and residual products in Belgium was the subject of a paper read by Baron EVENCE COPPÉE, of Brussels, at the autumn meeting of the Iron and Steel Institute held in that city last week. The following are the portions of the paper of chief interest to "JOURNAL" readers.

OVEN DESIGN AND FIRE-BRICK CONSTRUCTION IMPROVEMENTS.

In the early part of the paper, the author dealt with the improvements which have been effected in the design of coke-ovens from about the middle of the last century, and described the Semet-Solvay and Coppée types. He pointed out that all the different types of retort-ovens had been designed to attain the same objects—viz., to increase the production of coke by shortening the coking period, to obtain a greater yield of coke, and to produce good coke from coals low in volatile matter and agglutinative power. The successive improvements effected to obtain these results were: (1) The perfecting of the arrangements for controlling the admission and circulation of gas and air in the flues in such a way as to produce higher temperatures and to distribute the heat uniformly along the whole length and height of the oven wall. (2) Adapting the dimensions of the ovens and the coking time to suit the nature of the coal. (3) Perfecting the construction of the fire-brick work so as to allow the side wall to be decreased in thickness—thus permitting rapid conduction of heat to the ovens without endangering the solidity of the structure.

In England, the recovery of bye-products has not made so much progress, for, in the author's opinion, two chief reasons: (1) The first recovery ovens erected were by no means so perfect as they are now, and produced a coke which was undoubtedly inferior to beehive coke; and (2), on account of difficulties in connection with refractory materials, the early constructors had several very unfortunate experiences, resulting in defective working of the ovens. The first batteries of bye-products ovens constructed in the United Kingdom were built of English fire-bricks, which had given entire satisfaction in non-recovery ovens; but it was ascertained from practical experience that they were not suitable for bye-products ovens. English fire-brick makers in general have not, the author said, seen their way clear to manufacture bricks which will pass the very stringent tests imposed upon them, or where the quality of the brick seems to be satisfactory their high price is prohibitive.

The quality of fire-bricks for coke-oven building is a question

of paramount importance, considering the extent to which the whole plant may suffer if the ovens, which are the chief part of it, do not give every satisfaction. The proportions of silica and alumina in a brick may vary considerably, thereby giving rise to differences in the behaviour of the brick when subjected to high temperatures; and account has to be taken not only of the greater or less degree of resistance to fusibility, but also of the expansion of the brick.

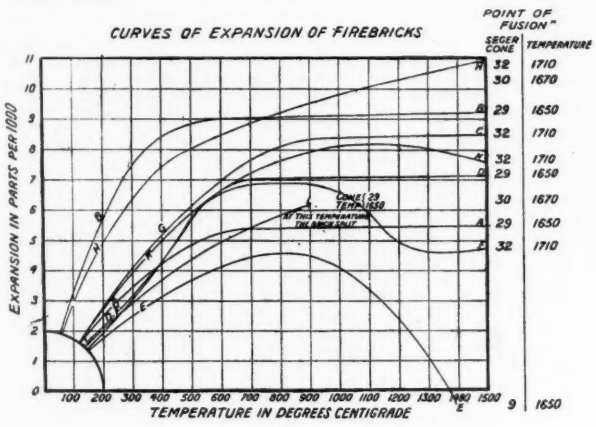

CURVES OF EXPANSION OF FIREBRICKS
POINT OF FUSION"
SEGER CONE
TEMPERATURE
EXPANSION IN PARTS PER 1000
TEMPERATURE IN DEGREES CENTIGRADE
CONE 29 TEMP. 1650
AT THIS TEMPERATURE THE BRICK BEGINS TO MELT

Fig. 1.

With the view of illustrating this point, the author prepared a series of curves showing both the expansion of various bricks with increasing temperature and also the temperatures at which different bricks begin to fuse. (See fig. 1.) The temperatures are plotted as abscissæ and the expansions (in thousandths) as ordinates. The curve A refers to a Belgian brick, and it will be seen that it expands regularly up to about 700° C., at which temperature it reaches a maximum dilatation of a little over 5-100oths, or about 0·5 per cent., and when heated further no more expansion takes place. Similar curves have been obtained with another Belgian brick, B, and a German brick, D. G is a French brick. All the above are good bricks, eminently suitable, in the author's opinion, for coke-oven construction. H is a brick of English origin, which has a rather high expansion, but is otherwise good. Looking, on the other hand, at the remaining curves, it is seen that the bricks E and F, which are of French manufacture, reach a maximum expansion at about 800° C. and 900° C. respectively, after which they commence to contract. Two varieties of English bricks, K and L, have the same characteristics, although to a less extent.

The author thought it was evident that bricks which behave in this manner are unsuitable for coke-oven construction, inasmuch as the contraction would set up cracks and dislocations in the oven structure, thus allowing direct communication between the coking chamber and the heating flues, with consequent loss of gas and bye-products. Another English brick, L, begins at about 900° C. to develop cracks and fissures which render it useless. The abnormal behaviour of some of these varieties of English bricks was not discovered by coke-oven constructors till after some disastrous experiences; and it was only by making careful tests similar to those just described that it was possible to demonstrate the inferiority of particular bricks for the construction of bye-product ovens.

Utilization of Coke-Oven Gas.

In dealing with this subject, the author pointed out that before using the surplus gas from regenerative ovens for power production in gas-engines, a certain amount of chemical purification is necessary. The percentage of sulphur contained in the gas evolved from the ovens is fairly high; and though a large proportion of it is removed during the process of recovering the bye-products, the amount of sulphur contained in the so-called "clean" gas is too high for the gas to be used in engines without further purification. This is usually carried out by passing the gas through a battery of oxide purifiers; but it is not necessary to carry the elimination of sulphur to the same extent as in gas intended for lighting purposes. From certain recent observations which have been made with respect to the effect of sulphur on the cylinders of gas-engines, it would appear that the corrosive effect is due more to condensation in the cylinder, produced by variation in the load, than to the actual presence of sulphur.

Quite recently, an improvement has been effected in the utilization of gas in gas-engines by extracting the waste heat from the burnt gases expelled from the cylinders. These gases leave the engine at a temperature of about 500° C.; and they are made to pass through steam-boilers of appropriate design. In this way it has been found possible to raise about 2 lbs. of steam per horse-power-hour developed by the engine, which is equivalent to an increase of about 13 per cent. on the power developed.

Town Lighting.

One of the latest, and probably the most profitable, development, however, in the use of this surplus gas is its application to town lighting. The transport of gas under pressure has been so perfected that it now presents scarcely greater difficulties than the transport of water. Moreover, since the old type of batswing burner has now been almost entirely superseded by incandescent burners, the candle power of the gas supply is of little importance, and the calorific power is the only point that need be taken into consideration. The ordinary surplus gas that is obtained from coke-ovens, however, scarcely reaches a sufficiently high standard in this respect.

Practically speaking, it may be said that for town lighting purposes a gas should have a calorific power of at least 560 B.Th.U. per cubic foot. Coke-oven gas is very seldom so rich as this, and would require to be carburetted by means of benzol or mineral oil in order to bring it up to the required calorific power. To avoid the expense of carburetting, the more usual process is to fractionate the gas evolved from the ovens.

It has been found that the composition of the gas given off from coal during the process of distillation in a coke-oven is by no means uniform. The calorific power gradually increases from the commencement of the distillation until a maximum is reached, after which the gas becomes poorer; and the results of a large number of experiments show that the average calorific power of the gas evolved between (say) the third and eighteenth hours of the carbonizing period will be in excess of 560 B.Th.U. per cubic foot. By thus dividing the gas evolved from the ovens into these two parts, it is possible to use the rich portion for town lighting, while the rest is used for heating the ovens; and any surplus can be employed for the production of power in gas-engines or for other suitable purpose.

The proportion of the lighting gas to the whole will depend entirely upon the quality of the coal. At the author's ovens at Ressaix, for instance, they are coking what would be called a poor coal as judged by English standards, containing as it does only 18 to 19 per cent. of volatile matter, and less than 9400 cubic feet of gas per ton. The amount of rich gas of 560 B.Th.U. and upwards suitable for town lighting is rather more than 4050 cubic feet per ton, or about 43 per cent. of the whole.

The results obtained in this field show conclusively that the production of lighting gas can be carried on simultaneously with the production of metallurgical coke; and the author considers that very large developments on these lines may be expected in the near future. America and Germany were the first countries to take up this question to any large extent; and at the present day Germany has no less than 45 towns or communes which are wholly or partly supplied with lighting gas derived from coke-ovens. The question is also being taken up in Belgium; and arrangements have already been made for lighting Liége, Ghent, Mons, Ostend, one of the suburbs of Brussels, and other places with coke-oven gas. Surplus gas may therefore be looked upon as an important and valuable bye-product, and its utilization on the preceding lines will further contribute to the profits already obtained—thus tending to reduce the cost of the manufacture of coke.

Recovery of Residuals.

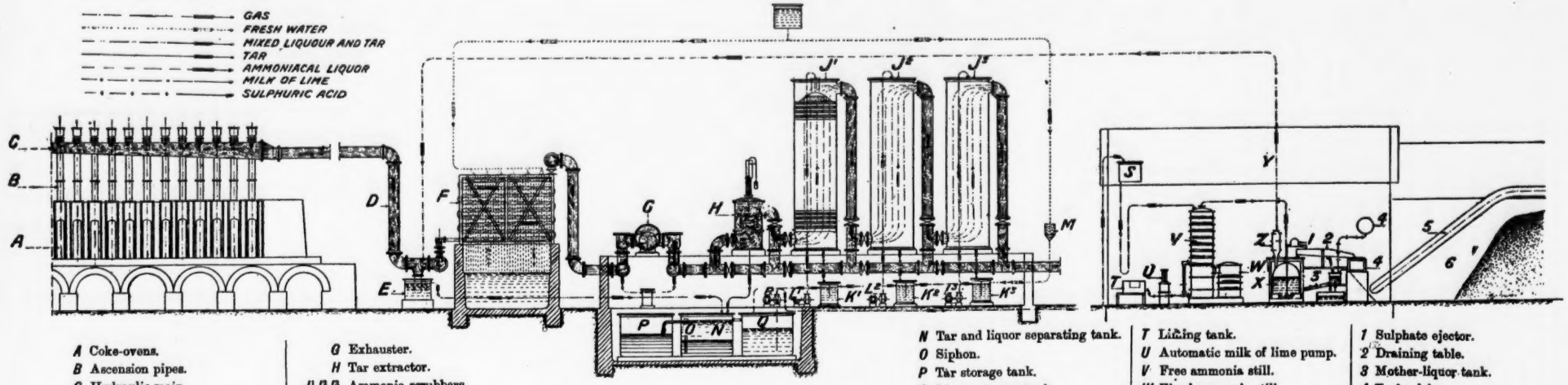
The carbonization of coal, which was at one time carried out with the sole object of making coke, and perhaps incidentally steam, is now accompanied by the production of other residuals of great value; and one might really say that in a modern coking plant, where the surplus gas is sold for town lighting or used for power production, the coke is no longer, properly speaking, the principal product manufactured. It is impossible to speak of coke-ovens without referring to the question of the recovery of bye-products. Those usually recovered are tar, ammonia, and benzol.

The earliest process of ammonia recovery, and the one which is still in greatest use, is the well-known "wet" process, which is diagrammatically illustrated in fig. 2. The gases evolved from the ovens are cooled down to approximately atmospheric temperature in such a way that they deposit all condensable constituents—tar, water, and fixed ammonia. The remainder of the ammonia (being the free or uncombined part) is extracted from the gas by washing with water in appropriate scrubbing apparatus. The ammoniacal liquors produced by condensation and by scrubbing are mixed together, and distilled with steam and milk of lime, which results in the liberation of the whole of the ammonia. The ammonia vapours may then be either condensed to form concentrated ammonia liquor, or more usually they are passed into a saturator containing sulphuric acid, for the formation of sulphate of ammonia.

The disadvantages which have been urged against this process are the large amount of steam required for distillation, and the fact that the waste liquor produced is sometimes troublesome to get rid of. Consequently, other processes have been devised in which scrubbing the gas with water has been dispensed with—thus reducing the consumption of steam and the production of waste liquor.

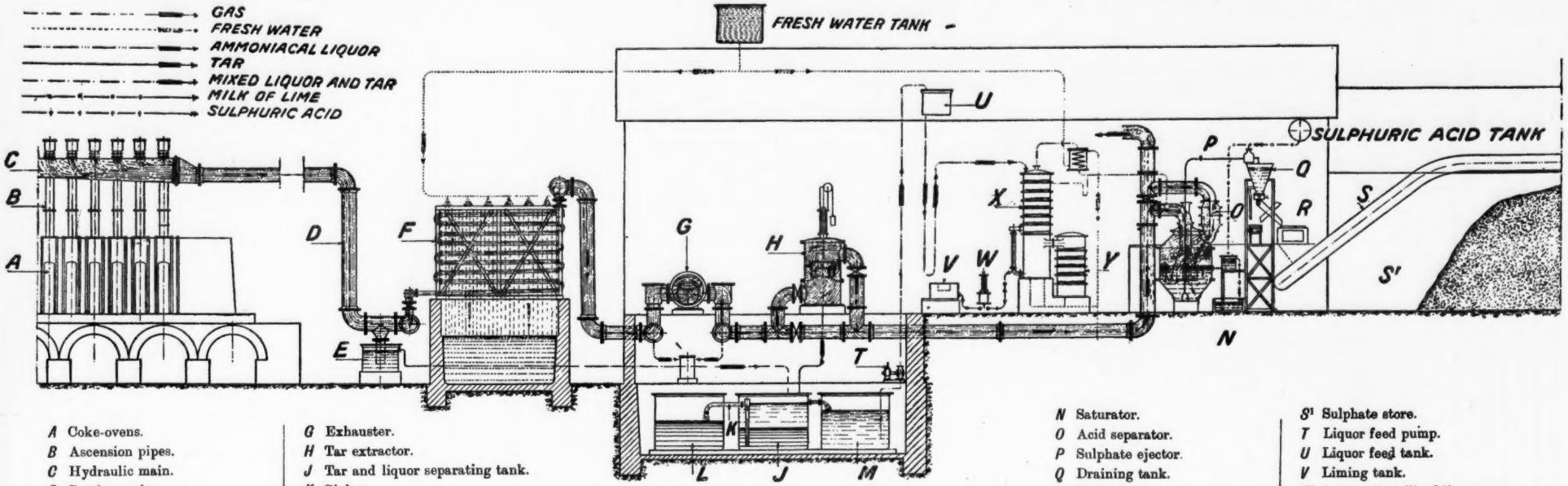
There are several processes of this kind in use, the principle of which will be seen on reference to fig. 3. The gases are condensed to atmospheric temperature as in the "wet" process, resulting in the precipitation of the tar and the fixed ammonia. At this stage, the gases are passed direct into the acid bath. The condensed ammoniacal liquor containing the fixed ammonia is distilled with steam and lime as before, and the resulting free ammonia is passed with the rest of the gas into the saturator.

Much has been said and written as to the relative merits of the "wet" and "direct" processes; and the author did not attempt to



A Coke-ovens.
B Ascension pipes.
C Hydraulic main.
D Suction main.
E Pitch cistern.
F Horizontal tubular condenser.
G Exhauster.
H Tar extractor.
$J^1J^2J^3$ Ammonia scrubbers.
$K^1K^2K^3$ Seal pots.
$L^1L^2L^3$ Liquor pumps.
M Feed measuring tank.
N Tar and liquor separating tank.
O Siphon.
P Tar storage tank.
Q Liquor storage tank.
R Liquor feed pump.
S Liquor feed tank.
T Liming tank.
U Automatic milk of lime pump.
V Free ammonia still.
W Fixed ammonia still.
X Saturator.
Y Devil gas pipe.
Z Acid separator.
1 Sulphate ejector.
2 Draining table.
3 Mother-liquor tank.
4 Turbo drier.
5 Sulphate conveyor.
6 Sulphate store.

FIG 2.—DIAGRAM OF BYE-PRODUCTS PLANT WITH WET SULPHATE RECOVERY.



A Coke-ovens.
B Ascension pipes.
C Hydraulic main.
D Suction main.
E Pitch cistern.
F Horizontal tubular condenser.
G Exhauster.
H Tar extractor.
J Tar and liquor separating tank.
K Siphon.
L Tar storage tank.
M Liquor storage tank.
N Saturator.
O Acid separator.
P Sulphate ejector.
Q Draining tank.
R Turbo drier.
S Sulphate conveyor.
S^1 Sulphate store.
T Liquor feed pump.
U Liquor feed tank.
V Liming tank.
W Automatic milk of lime pump.
X Free ammonia still
Y Fixed ammonia still

FIG. 3.—DIAGRAM OF BYE-PRODUCTS PLANT WITH SEMI-DIRECT SULPHATE RECOVERY.

compare them. But in his opinion neither possesses any advantage of real importance over the other. The position may, he thought, be most fairly summarized by saying that "each process has certain advantages not possessed by the other, and that the choice of one rather than the other is a matter of the local conditions under which the plant has to work."

There are other processes which have been proposed for the recovery of ammonia, quite distinct in their character from any of those previously referred to. The author looks upon them as not having yet attained a practical stage; but they are interesting to note, "since they show promise of effecting considerable economy in the cost of the manufacture of sulphate of ammonia, if and when the difficulties which have so far prevented them from passing out of the experimental stage have been successfully overcome." The Feld and Burkheiser processes, for example, have been designed to do away with the necessity for using sulphuric acid. In these processes, the ammonia is made to combine with the sulphur contained in the gas in successive stages—resulting, in the end, in the formation of sulphate of ammonia. Though certain practical difficulties have so far prevented these processes from being successfully carried out on a manufacturing scale, there are grounds for hoping the difficulties will ultimately be overcome, and the processes brought to successful application.

Passing to the recovery of benzol, the author remarked that it had made great strides in the last few years, due very largely to the increase in its use in automobiles.

Before leaving the subject of bye-products recovery, the author offered a few observations about another process proposed by Dr. Häusser for the production of nitric acid and artificial nitrates from coke-oven gas. The details of the process are now being worked out; the main idea being to oxidize nitrogen in an excess of oxygen under pressure produced by the explosion of a gaseous mixture of which coke-oven gas is one of the constituents. This process was mentioned with the view of showing the possibilities of constant development in the future; and when the great strides that have been made in chemical science in the last few decades are reviewed, it is impossible to predict any limit to future progress.

The Future of the Residuals Industry.

In bringing his interesting paper to a close, the author said: The question has often been raised as to whether the extension of residuals recovery may not ultimately defeat its own ends by putting on the market such increasing quantities of bye-products that the supply may ultimately reach, or possibly overtake, the demand, and thus force down prices. A careful study of what has happened in this respect in the past, however, shows that there is very little danger of this being the case. Taking sulphate of ammonia, as being the principal bye-product, we find the total world production of sulphate in 1900 was about 450,000 tons. By 1908 this had increased to 880,000 tons; while in 1912 the total production was 1,300,000 tons—the increase for the last four years being 10, 13, 7, and 10·6 per cent. on the preceding year. The average of the prices of sulphate f.o.b. London, Liverpool, and Hull during these years was as follows: 1908, £11 13s. 7d.; 1909, £11 4s. 10d.; 1910, £12 1s. 6d.; 1911, £13 12s. 3d.; 1912, £14 4s.; and 1913 (four months only), £13 17s. 7d. With the exception of 1913, which has not yet recovered from the abnormal rises of 1911 and 1912, we observe a steady rise in the price, notwithstanding the considerable increase in production.

The following table shows the total production (in tons) of sulphate in the years 1908 and 1912 of the five principal sulphate producing countries, and also the amounts of sulphate used in those countries in the same years:—

	Production.		Consumption.	
	1908.	1912.	1908.	1912.
Germany	313,000	492,000	291,000	425,000
England	321,000	379,000	83,000	88,000
United States	80,000	160,000	199,000	218,000
France	49,000	69,000	80,000	90,000
Belgium	29,000	44,000	40,000	46,000

It will be seen that the United States, France, and Belgium consume more sulphate than they produce; Germany consumes 84 per cent. of her very large production; while in England the consumption is only 24 per cent. of the production.

The following table shows the direct connection between the amounts of sulphate used in these countries (except the United States, for which there are no records) and the amounts of the principal food crops raised:—

	Sulphate Used per Acre of Cultivated Land.	Wheat.	Barley.	Oats.	Potatoes.
	Lbs.	Lbs.	Lbs.	Lbs.	Tons.
Belgium	17·83	2228	1908	2572	6·58
Germany	9·98	2012	1400	1586	5·25
England	5·35	1756	—	1591	5·05
France	2·23	1238	980	1154	3·18
United States	1·34	—	—	—	—

It will be seen from this table that there is plenty of room in some of the above countries, especially in England and France, for extending the use of sulphate of ammonia. What has been attained in Belgium will, no doubt, be realized in the other countries; and, moreover, the use of sulphate is constantly extending into new areas.

The position is much the same with reference to tar, for which new uses continue to be found. Apart from the fact that it is the starting-point of the great aniline colour industry, it is an excellent liquid fuel, although hitherto it has not been largely employed in this respect. Furthermore, recent trials have proved its extreme suitability for use in Diesel engines. It is also increasingly used for tarring roads. By the distillation of tar we produce pitch and the various middle and light oils.

The consumption of pitch for briquette making increases considerably from year to year; while quite apart from their use for creosoting and preserving timber, the increased use of internal combustion engines will result in an increased demand for these oils as fuel, especially for marine work, on account of the great advantages of liquid fuel in respect to stowage and handling and higher thermal efficiency. Seeing that the price of coal, with which tar oils for power purposes will chiefly be in competition, can only tend to increase in the future, it is reasonable to suppose that the price of tar oils will rise in proportion. The value of pitch, also, will necessarily follow the price of coal.

As for benzol, we are at this moment beginning to see it being very largely used for motor traction; and there is undoubtedly a great future before it in this respect. It can also be employed for driving locomotives. There are already a good many benzol locomotives working in mines.

We have then, in my opinion, every encouragement to look forward to the future with nothing but confidence as far as bye-products are concerned.

In the course of the discussion upon the paper,

Mr. Alfred Hutchinson said that two years ago a battery of bye-products ovens was put in operation at Skinningrove. From unscreened Durham coal, about 60 per cent. of coke had been obtained; while the total quantity of gas was about 8½ per cent. of the total weight of coal coked. In recent practice, the height of the ovens had been increased; and those at Skinningrove would take a charge of 9 tons of dry coal, so that the total yield of coke was satisfactory. The effect of increasing the height was to give a cooler crown, which had been found to result in a splitting-up of the ammonia products and an increase of about 10 per cent. in the yield. The question of the supply of bricks was becoming important, owing to the increase in the number of regenerative ovens. But at Skinningrove, English bricks had been found to be as good as Continental ones, and brickmakers in Durham and Yorkshire were now in a position to supply bricks which would withstand the test of many years' work. In reference to the various processes for the recovery of bye-products, at Skinningrove they had used the direct process, which they believed possessed distinct advantages over the indirect. All escape of ammonia during distillation was saved; and, what was still more important, there was given to the gases, at the various stages of cooling-down, an opportunity of getting out separately the products which were otherwise obtained only in the mixture of liquids.

Mr. J. H. Darby could not agree that English bricks were as good for these requirements as those which they had been in the habit of obtaining from the Continent in the past. The reliability of the linings was a very important point; and he was glad to hear of what was being done in England.

Mr. Greville Jones said his experience of English bricks was that they lasted from seven to eight years.

Professor Thomas Turner said that the question of brick manufacture was of great interest to the English Midland district; and it was recognized that, for various purposes, different qualities of bricks had to be made which had to comply with certain specifications. He had had at various times to determine the expansion of Stourbridge fire-bricks, and had not found it a very simple matter. He believed that Great Britain was behind not only Belgium but also Germany in the field of fire-brick manufacture.

TAR DISTILLATION IN METALLURGICAL PRACTICE.

The Cava Process.

This was the subject of a paper by M. Gevers-Orban, of Liége, submitted at the autumn meeting of the Iron and Steel Institute in Brussels last week.

The author began by laying down the proposition that a metallurgist should make his own coke. Formerly coke-ovens were situated near the collieries; whereas now their proper place is in the iron-works, as it is there that the bye-products of coking are required. These are: (1) The coke-oven gas, which supplies the metallurgist with cheap motive power. (2) This gas likewise supplies an ideal fuel for open-hearth furnaces. (3) The coke-oven tar is readily converted into steel-works tar for use in converter linings. (4) The distillation of the tar furnishes the oils required in the heating or reheating, annealing, and hardening furnaces; and also a cheap binder for the agglomeration of ore dust into briquettes. If the metallurgist makes his own coke, in the proportion of 1 ton for each ton of pig iron, he will make for each ton of the latter about 100 lbs. of tar, which is at present worth 1s. 8d. This is a factor not to be despised in connection with the cost price of the pig iron. The treatment of the tar is carried out wholly in distilleries. Hitherto these have been inconvenient, costly, and dangerous plants, requiring the services of a special staff. A distillery for dealing with 6000 tons of tar is

estimated by Herr Schneider, of Cologne, as costing £6000 to instal—a figure which Mattar and Lünge and Kohler regard as an under-estimate. In these circumstances, it is not surprising that coke manufacturers at the present day seldom concern themselves with the distillation of their own tars.

Now, however, since the 1st of January of the present year, the Cava process, in operation at the Espérance Bonne-Fortune Collieries, Montegnée, Liége, supplies a simplified means of dealing with the tar question. At these works, which are capable of treating 24 tons daily, or 8000 tons per annum, the tar enters at one end of a horizontal boiler retort, 6 metres in length and 1·5 metres in diameter, which is half filled. Within this boiler the tar slowly travels, becoming gradually heated during its journey forward; while large blades, fixed to a horizontal shaft, plunge into the bath, and expose thin layers of the tar to the oxidizing and evaporating action of a brisk current of air. When the tar has reached the front part of the boiler, it has become pitch at a temperature of 200° to 250° C., according as it is desired to obtain a moister or a drier pitch; whereas in the ordinary retorts the temperature exceeds 360° C. The pitch trickles from the retort, by gravity continuously through a spiral cooler, and attains a temperature of 90° C. either in the pitch-tanks, tank-waggons, or in some sort of mould. At the Bonne-Fortune works, as the accompanying illustrations show, the tar undergoes, in addition, a preliminary oxidation by means of a current of ozonized air in an ozonizing chamber. This additional oxidation is applied with the sole object of increasing the yield of pitch, as the works have been specially built to supply pitch for a coal-briquetting plant.

The advantages claimed to be realized by the Cava process, over distillation in ordinary retorts, are threefold.

1.—The operation is continuous; that is to say, the tar enters continuously at one end of the boiler, and the pitch flows continuously from the other end; while the oils of distillation pass off through a spiral placed on top of the boiler. The temperature in every part of the boiler and throughout the whole mass therefore remains constant, and the wear of the boiler is insignificant; whereas the ordinary retorts wear rapidly, owing to the high and fluctuating temperatures to which they are subjected. The efficiency of the boiler is three times as high as that of an ordinary retort of the same capacity, as it need never be emptied nor refilled nor reheated after having cooled down. Considerably less labour is also required, owing to these causes.

2.—In the Cava boiler, distillation is, as a matter of fact, superseded by evaporation; that is to say, the air current sweeps over the large moving surfaces covered with tar, and carries off from them the lighter products. This evaporation takes place at a much lower temperature than the distillation; and, further, the vapours are carried away mechanically by the air current, whereas in the ordinary process of distillation the mechanical energy expended in driving off the hydrocarbon vapours has to be supplied by the furnace. The result of the low temperature involved is a low coal consumption, diminished wear in the retort-boiler, and reduced danger of fire during the distillation.

3.—The air-current, by circulating within the boiler, effects an oxidation which increases the proportion of the bituminous products, and consequently increases to the extent of 25 per cent. the binding qualities of the pitch, which thereby acquires greater commercial value, as, for example, for the briquetting of coal dust or ore dust.

As the result of these three advantages, a Cava distillery with a capacity of 6000 tons of tar per annum costs only £2400, while an ordinary distillery would cost from £6000 to £8000.

The Bonne-Fortune distillery occupies a building only 6 metres wide, 6·5 metres in length, and 7 metres in height. Such a distillery would, the author submitted, form a simple and profitable adjunct to every coke-oven plant.

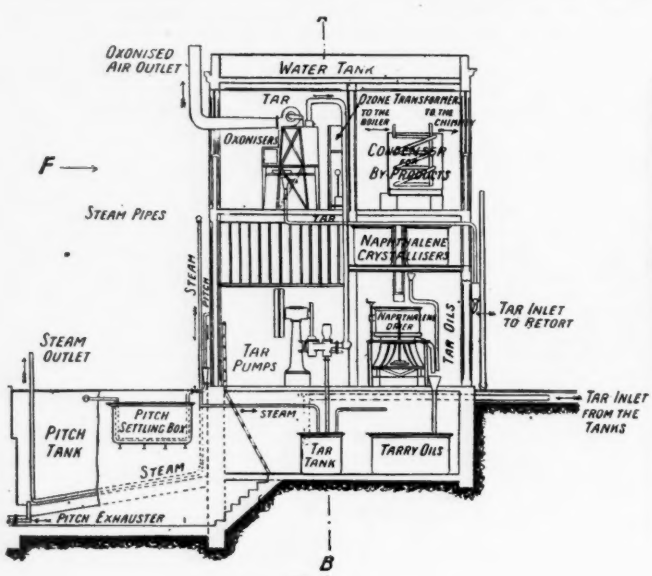


Fig. 1.

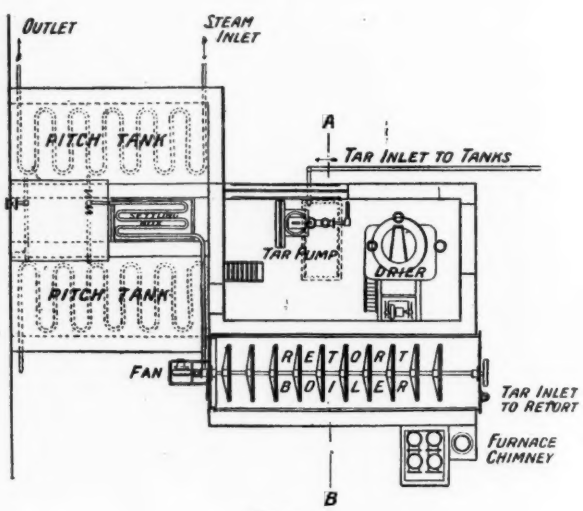


Fig. 2.

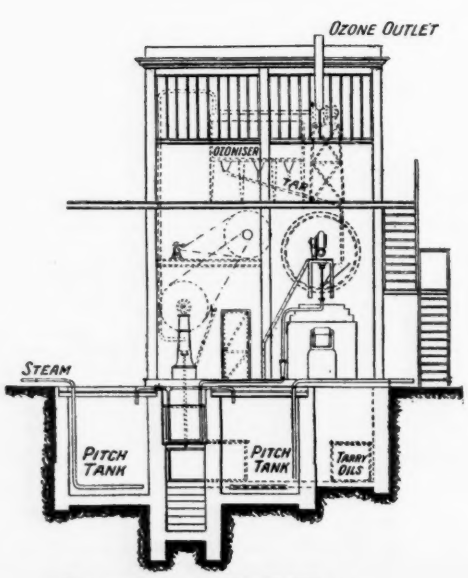


Fig. 3.—Section on Line F of Fig. 1.

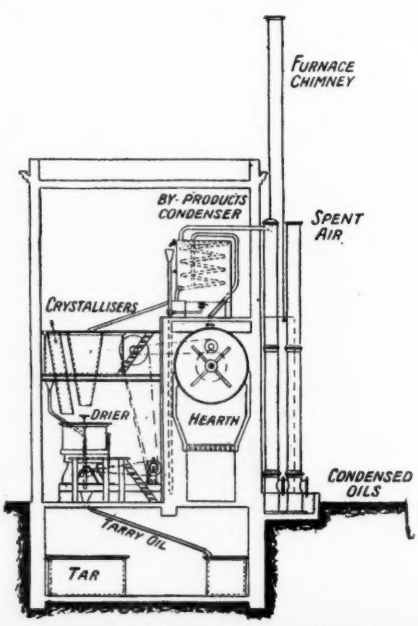


Fig. 4.—Section on Line A B of Fig. 2.

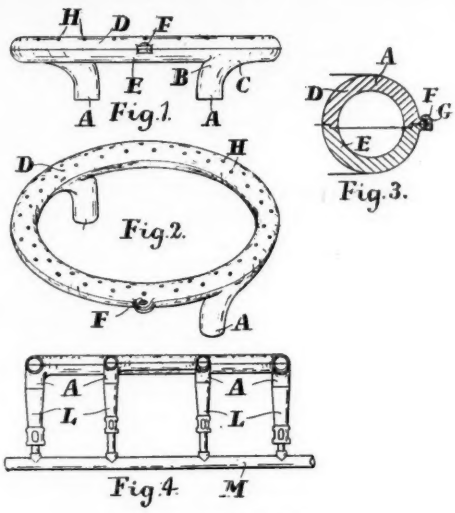
REGISTER OF PATENTS.

Gas-Burners.

TOOTH, L. F., of the Commercial Gas Company, Stepney.

No. 13,583; Aug. 10, 1912. Re-dated July 17, 1913.

This invention relates to gas-burners of the ring type, and comprises a construction of burner whereby the individual jets of flame are "rendered more uniform and steady." The burner-ring is fitted with two or more inlet tubes arranged to enter the ring tangentially; and these inlets (which are symmetrically disposed) may be arranged to enter the ring horizontally or vertically—this being effected in the case of the vertical inlets by turning their upper ends to merge into the ring.



Tooth's Heating Burner.

Fig. 1 shows a burner-ring in side view; fig. 2 is a perspective view; and fig. 3 a sectional view. Fig. 4 is a side sectional view of a burner composed of two rings.

The burner-ring is fitted with inlet tubes A arranged to enter the ring tangentially. They are symmetrically disposed with respect to the ring. Where the inlets are vertical (as shown), their upper portions B are turned as at C so as to merge into the ring, which is composed of two sections D E secured together by screws F passing through lugs G. Owing to the arrangements of the inlets A with respect to the ring, the combustible mixture flows round the ring and emerges from the openings H "in uniform and steady jets."

Such burners are said to be of particular use for heating open-fired boiling furnaces—such, for instance, as that described in patent No. 18,523 of 1912. In heating such furnaces, it is advantageous to employ a burner composed of more than one ring, as in fig. 4, which shows a burner composed of two rings of different sizes, disposed concentrically. Each ring is of the form illustrated in fig. 1; being provided with two inlets A. Bunsen tubes L, carried by a horizontal supply pipe M, are secured to the inlets, and serve both to supply the gaseous mixture and to support the rings.

Hydrogenation of Unsaturated Substances.

LESSING, R., of High Holborn, W.C.

No. 18,998; Aug. 19, 1912.

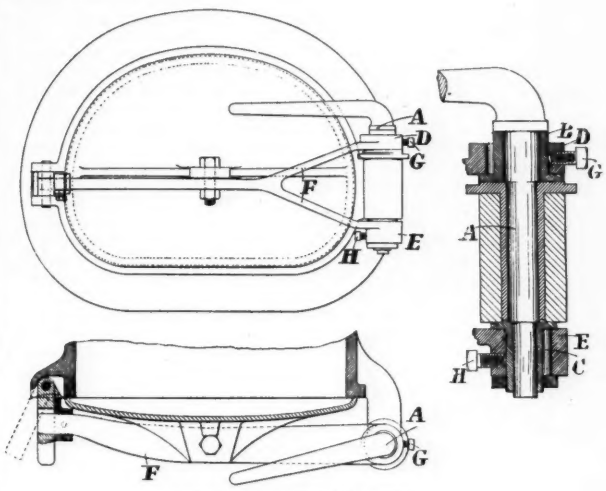
This invention consists in subjecting the substance to be hydrogenated to the action of hydrogen or a hydrogenating agent—that is to say, a gas containing hydrogen—at a suitable temperature in the presence of a metallic compound which is decomposed at that temperature with liberation of metal. The patentee claims: 1. A process of hydrogenation by subjecting the substance to be hydrogenated to the action of a hydrogenating agent in the presence of a catalyzer, wherein the substance is heated together with the hydrogen or hydrogenating agent and a metallic compound which is decomposed with liberation of metal at the temperature used. 2. A process as defined in claim 1, wherein the metallic compound is a metal carbonyl, preferably nickel carbonyl. 3. A process as defined in claims 1 and 2, wherein the metal carbonyl is dissolved in the substance to be treated, and the solution is sprayed into a heated vessel in which it is brought into contact with hydrogen or the hydrogenating agent. 4. A process of hydrogenating glycerides or fatty acids by bringing simultaneously into contact the hydrogenating agent, a metal carbonyl (preferably nickel carbonyl), and the glyceride or fatty acid at a temperature suitable for the hydrogenation and for decomposing the metal carbonyl.

Retort-Lid Hinges.

HOLMAN, S., of Collingham Road, South Kensington, S.W.

No. 18,283; Aug. 8, 1912.

According to this invention, the holes for the hinge-pin in the hinge-lugs of the lid, or the cross-bar of the fastening by which the lid is carried, are of oblong cross section; and the hinge-pin is received into loose socket members fitting slidably within the holes and maintained in position so as to permit of adjustment.



Holman's Retort-Lid Hinges.

A front elevation of a retort-lid provided with such a hinge is given; also a corresponding plan view (partly in section), and a sectional elevation of the hinge, to an enlarged scale.

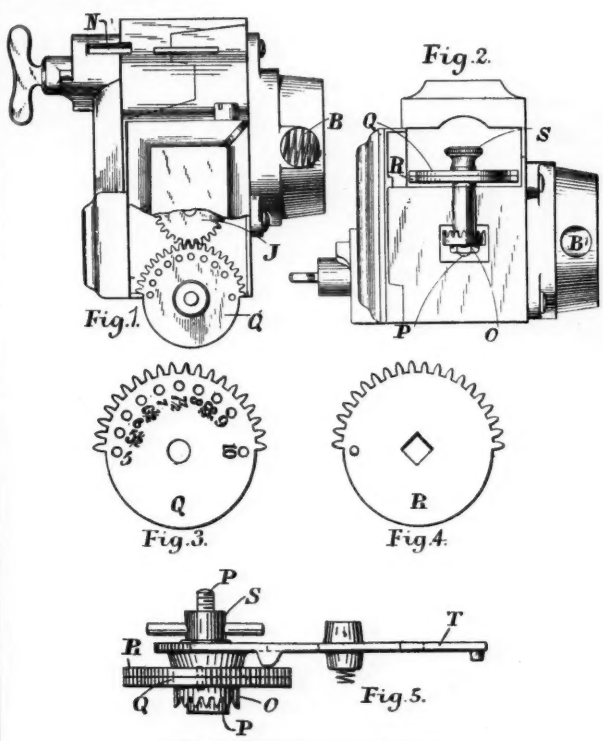
The eccentric hinge-pin A has its eccentric portions fitted rotatably within sockets or collars B C within oblong openings or holes in the hinge-lugs D E of the cross-bar F by which the lid is carried—the length of each hole being parallel with the face of the lid, while the width is approximately the same as the exterior diameter or width of the corresponding socket or collar B C, so that the latter may slide in it. The sockets or collars B C are maintained in adjusted positions in the holes of the hinge-lugs by such means as adjusting screws G H mounted in the hinge-lugs at that end of each opening or hole which would be brought into contact with the corresponding socket or collar B C by the weight of the lid hanging on it when in the closed position. The adjustment of the position of the sockets or collars B C is effected by the screws G H being run further in or out of the hinge D E, so that they are pressed away from, or permitted to approach, the end of the socket openings or holes in the hinge-lugs.

Prepayment Gas-Meters.

WILSON, G., of 's-Gravenhage, Holland.

No. 20,951; Sept. 13, 1912.

This invention has for its object to provide means for readily adjusting the mechanism of prepayment gas-meters to suit various prices of gas passing through them.



Wilson's Prepayment Gas-Meter.

The invention is shown as applied to prepayment mechanism for gas-meters of a well-known type. Fig. 1 is a plan of the mechanism with part of the upper cover broken away. Fig. 2 is an end elevation.

Figs. 3 and 4 are plans of two elements of a two-part gear-wheel to be hereafter described. Fig. 5 is a side elevation of a modified construction.

The mechanism illustrated in figs. 1 to 4 comprises a main casing having a slot A for the insertion of an operating coin. The casing encloses the valve actuating and controlling mechanism, while a separate gas-tight casing encloses the valve and the gas-passage thereto. The latter casing is removably secured at the side of the main casing. It is formed with an inlet port B and an outlet port B^1, which are arranged so that the gas must pass over the face of a diaphragm (not shown) before it can reach the outlet. A helical spring operates normally to hold the valve open. Adjacent to the coin-slot is an operating handle, while at the top of the main casing there is a cover enclosing the counter mechanism. This mechanism comprises a wheel J which drives the registering mechanism and the means for shutting the valve, and is itself driven from the meter. Adjoining the coin-slot, there is commonly provided another slot N for receiving sixpences, while the slot A is for pennies. Other slots for coins of other sizes may be provided if desired.

The meter is connected to the prepayment mechanism through a gear-wheel O, which is carried on the lower end of a shaft P, on the upper end of which is a two-part gear-wheel which meshes with the wheel J. The effective number of teeth in this two-part wheel determines the quantity of gas supplied for a specified coin; and to vary this quantity the effective driving circumference—*i.e.*, the effective number of teeth on the circumference of this wheel—is varied. The two part gear-wheel comprises two elements Q and R, each of which is only toothed throughout half of its circumference; the remaining part being cut away sufficiently to clear the teeth on the wheel J. The element R is formed with a square hole which fits on a squared portion of the shaft P; while the element Q is preferably formed with a round hole, so that when disengaged from the element R, as hereafter described, it may readily be rotated on the shaft P, and its angular relation to the element R is thereby adjusted.

The operation of the mechanism is as follows: While gas is passing through the meter, the wheel O will be continuously rotated, and, consequently, will continuously drive the two-part gear-wheel Q R, which, in turn, will drive the counter-wheel J, and through the latter gradually bring the prepayment mechanism round to the position in which the valve will be shut and the supply of gas cut off. If for any reason it is desired to vary the quantity of gas supplied for a specified coin, all that is necessary is to vary the effective driving circumference of the two-part wheel Q R, which is done by adjusting the angular relation between the two elements Q and R. By increasing the number of teeth in this two-part wheel which are effective for driving, the length of the operative portion of the wheel is increased, and a less amount of gas will be allowed for any specified coin, since the counter-wheel J will be driven for a greater period at each rotation of the shaft P.

When the pin is in engagement with the hole marked 5 in the element Q, only half the circumference of the two-part wheel will be effective in driving—this being the position shown in fig. 1. This position of the wheel Q R therefore will correspond to the greatest amount of gas allowed for a specified coin—that is, when gas is cheapest. Supposing there is a rise in price, the element Q is adjusted angularly relatively to the element R until the highest price of gas is reached, which will be when the pin is in engagement with the hole marked 10. To change the quantity of gas allowed for any specified coin, all that is necessary is to remove the cover, partly unscrew the thumb-screw S, and lift up and rotate the element Q until the desired hole of the series is brought over the pin on the element R.

Fig. 5 shows a modified arrangement for mounting the shaft P and the elements Q and R of the two-part gear-wheel. Here the shaft P is carried in a bearing formed in a boss on a detachable plate T; and the lower end of the shaft P bears on the upper edge of the end wall of the casing. The lower end of the shaft is formed with a flange; and between this and the boss the elements Q and R are received—they being connected by the pin and slot connection already described. The element Q is, in this construction, formed integrally with the crown-wheel O, driven by the meter; so that there is no need to drive the shaft P and to connect one of the elements thereto by a square portion as in the other construction. This arrangement is said to have certain advantages over that illustrated in figs. 1 to 4 as regards applicability to existing apparatus.

Treating Tar, Pitch, and Similar Bituminous Substances.

D'OLIVIER-MANSAN, M. G. C. R., of Doughty Street, W.C.

No. 26,426; Nov. 18, 1912. Convention date, Nov. 17, 1911.

This invention relates to a chemical process for transforming and condensing the volatile oils or hydrocarbons and some of the heavy ones contained in bitumen, tar, pitch, and the like, into hydrocarbons of a special kind (hydrocarbons of a wax-like and resinous nature), and condensing the largest possible proportion of such resinous hydrocarbons from the bitumen, tar, pitch, &c., treated in such a way.

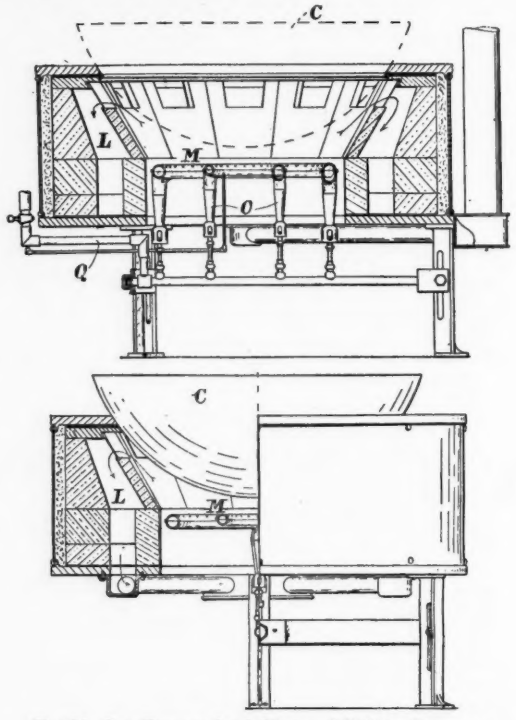
The patentee claims: 1. A chemical process or method of treating bitumen, tar, pitch, or other bituminous substances or mixtures of such substances, by the employment of successive heatings and addition of oxidizing agents. 2. A chemical process as claimed in claim 1, reducing and transforming, at comparatively low temperatures, the volatile oils or hydrocarbons contained in bitumen, tar, pitch, and other bituminous substances and mixtures, into hydrocarbons of a wax-like and resinous nature, by elimination of the hydrogen in excess from such volatile oils. 3. A binder obtained from bitumen, tar, pitch, and other bituminous substances by successive heatings, and adding before each such heating a quantity of potassium chlorate, until before the last one, when a small quantity of manganese dioxide is added with the potassium chlorate. 4. Bituminous compounds obtained by mixing the binder as obtained in claim 3 with other substances—such as silicates, sulphates, carbonates, coal dust, sawdust, sand, gravel, and the like, for the various purposes to which they may be applied. 5. Bituminous compounds obtained from bituminous mixtures of tar, pitch, bitumen, and the like, with silicates, sulphates, carbonates, coal dust, sawdust, sand, gravel, and the like, by successively heating such mixtures, and adding before each such heating a certain quantity of a mixture of potassium chlorate and manganese dioxide.

Gas-Furnaces for Boiling or Melting Purposes.

TOOTH, L. F., of the Commercial Gas Company, Stepney, E.

No. 18,523; Aug. 12, 1912.

This invention relates to gas-furnaces applicable for boiling-down sugar solutions, asphalt, and the like, or for melting metals. The patentee shows a form of the invention designed for sugar boiling. In this particular art, he says, "it is necessary that the apparatus be under perfect control, as the treatment required in any one case may be totally different from that required in another. For instance, one particular sugar requires to be slowly boiled until just upon the point of completion and then quickly boiled to cook the sugar; in another case, exactly the reverse action is necessary—*i.e.*, quick boil and a slow finish." By his invention, it is possible to adjust the heating to suit any particular class or quality of sugar.



Tooth's Gas-Furnace for Boiling and Melting Purposes.

The illustrations are a complete side sectional view of the furnace, and a rear view (partly in section).

The furnace is built-up of a sheet-metal casing secured to rings, the upper one serving as a seating for the boiling-pan C. Within the casing is built-up a lining consisting of sector-shaped blocks of refractory material; and between this lining and the casing is inserted a layer of slagwool or other non-conducting material. Parallel to the blocks named is another series of blocks which serve to support a row of tiles, resting against supporting tiles arranged beneath the upper ring. The blocks and tiles are sector-shaped to facilitate renewal. They form between them an annular chamber or flue L, which communicates with the heating chamber M through openings in the tiles. Two or more such openings are formed in the plate leading from the chamber L into boxes connected by pipes to a common box at the base of the chimney, and they are symmetrically arranged to ensure even draught. This secures uniform heating and also prevents damage to the lining, "since, with only a single outlet, the heated products are drawn to one side and cause fracture of the lining owing to unequal expansion."

The tiles are inclined, so as to fit closely about the pan C—an arrangement which "ensures a quicker and more efficient heating, as the heated products are caused to come into more intimate contact with the pan, and pass over the whole surface thereof more or less in the form of a film."

Within the heating chamber M are burners N (preferably of the "ring" type) supported by bunsen tubes O carried by a pipe connected to the gas supply by a bent pipe Q. In using the furnace, the position of the burners is first adjusted by the bolts shown so that the flames just impinge upon the bottom of the pan; and then by means of the cock the heating can be regulated as desired.

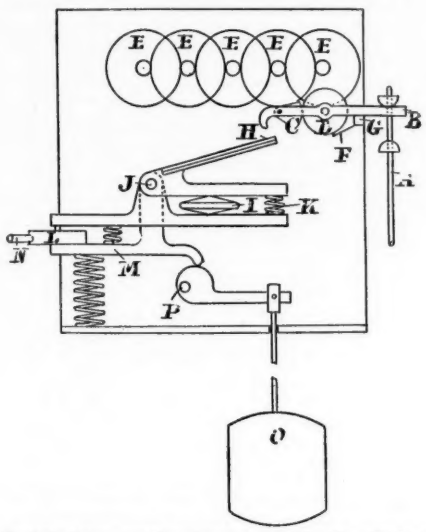
Compensating Gas-Meters.

ROOKE, T., of Victoria Street, Westminster.

No. 26,609; Nov. 20, 1912.

This is a device for compensating the effects of temperature, barometric pressure, pressure of supply, and (in wet meters) the effects of change of liquid level. In meters of the kind to which the invention is applicable, motion proportional to the volume of gas passed through

the meter is imparted by a rocking-lever clutch wheel and clutch or by a rocking-lever rachet wheel and pawl to any suitable counting device for recording in convenient units the quantity of gas passed through the meter.



Rooke's Compensating Arrangement for Gas-Meters.

As shown, a spindle A, which is supposed to have a reciprocating or rising and falling motion of frequency proportional to the speed or rotation of the drum of the meter, communicates motion to a rocking-lever B on which is mounted a clutch C, which engages with a clutch-wheel D, fixed to an arbor communicating motion to the counting device E. The clutch is arranged so as to rotate in one direction only the wheel D and the arbor of the counting train, to which the wheel is attached—a friction spring or other suitable detent F being provided. The limits within which the rocking-lever is free to move, owing to the rise and fall of spindle, and, consequently, the distance through which the clutch wheel is made to rotate by each oscillation of the lever B, are determined by two stops G H, the positions of which may be made to vary in conformity with variations of the surrounding temperature, atmospheric pressure, the pressure under which the gas that is to be measured is passing through the meter, and the level of liquid in a wet gas-meter. The positions of both stops may be made to vary in conformity with these changing conditions, against the effects of which the meter is to be compensated.

The illustration shows one method of constructing the compensating apparatus, which is supposed to be enclosed in a meter-case and exposed to atmospheric pressure, but not immersed in the gas.

The effects of changes of temperature are compensated by means of a bimetallic strip H, which is also one of the stops determining the length of arc through which the lever B is free to rock. This strip is arranged so that a rise of temperature diminishes the arc, and a fall of temperature has the opposite effect.

The effects of changes of atmospheric pressure are compensated by means of an aneroid chamber I. One end of the strip H is fixed to a lever which is free to move on a spindle J. The aneroid chamber is fixed to levers, and the atmospheric pressure exerted upon it is balanced by a spring K. Any increase of atmospheric pressure will compress the chamber and spring; the lever above it will move on the spindle J; and the stop H will move and increase the arc through which the lever B is free to move. A decrease of atmospheric pressure will have an opposite effect, and will diminish the arc through which the lever is free to move.

The effects of changes of pressure of supply are compensated by the chamber L, which is fixed to the lever M and has flexible sides similar to an aneroid chamber. One end of a lever which is free to move on the spindle J is held against the flexible side of the chamber L by a tension spring. The supply pressure of gas passing through the meter is communicated to the flexible sides of the chamber through a tube N. An increase of supply pressure expands the sides of the chamber and moves the lever and stop H, so as to increase the arc through which the lever is free to rock. A decrease of pressure has the opposite effect, and diminishes the arc.

The effects of changes of water level in a wet meter are compensated by a float O, which rests upon the liquid in the meter connected to a cam of suitable shape and free to move on the spindle P. The lever M, which is free to move on the spindle J, is held against the cam by the spring. A rise in level of the liquid raises the float and moves the cam levers and stop H, so as to diminish the arc through which the lever B is free to rock. A fall in level of the liquid has a contrary effect, and increases the arc.

When the volume of the gas passing through a meter is dependent upon changes of atmospheric pressure and also on changes of supply pressure, and when it is desired to compensate against the combined effects of these changes, the chamber I may be enclosed within the meter so that it is subjected to the pressure of the gas, while a chamber L and its tension spring are omitted from the mechanism. An increase of pressure acting on the chamber will move the stop H so as to increase the arc through which the rocking-lever B is free to move, while a decrease of pressure will have the opposite effect.

When changes of atmospheric pressure, together with changes of supply pressure, are compensated by means of the chamber I, and when it is also desired to compensate for changes of water level or liquid level in a wet meter, the two levers may be replaced by one which acts in the same manner as both would act if rigidly connected to one another.

Breaking-Down Clinker in Gas-Producer Furnaces.

GILL, G. M., of the Commercial Gas Company, Wapping.

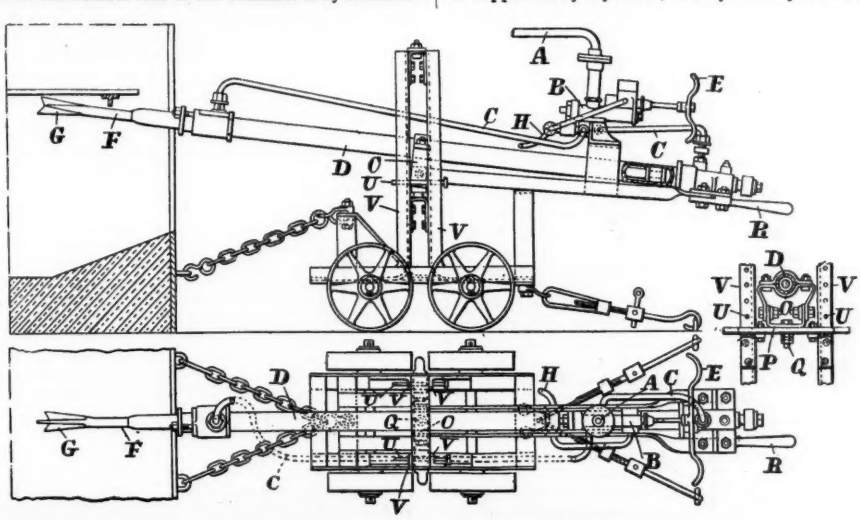
No. 23,862; Oct. 18, 1912.

In the case of certain gas producers, the patentee remarks, it is the custom to introduce periodically into the furnace a false grate at a suitable height above the ordinary grate, and then to remove the latter and break-down the clinker that may have formed. As ordinarily conducted, this not only occupies considerable time, but involves much hard manual labour—disadvantages to which may be added that of excessive wear upon the false grate, the bars of which, being introduced into a high temperature zone, soon become burnt and bend under the weight of the superincumbent mass. Hand breaking-down of the clinker furthermore imposes a limitation upon the depth (or back to front distance) of the furnace, since the implements employed are weighty, and cannot be manipulated usefully when in excess of a given length. The object of the present invention is to overcome these disadvantages, by providing for the mechanical breaking-down of the clinker by an appliance somewhat analogous to that employed in connection with power reciprocated tools for puddling iron and poking coke into retort-furnaces.

The illustration shows a side elevation (partly in section) of a hydraulically operated machine for removing the clinker from furnaces of substantially rectangular cross section, a plan of same, and a detail view showing in front elevation an arrangement for swivelling the cylinder.

The pressure fluid is admitted at A to a device B—a four-way rotary valve which regulates the supply of the pressure fluid to pipes C, which deliver it alternately to the opposite ends of a cylinder D. The valve device is controlled by a hand-lever E. The cylinder contains a piston, the rod of which is reciprocated by the action of the pressure fluid; and the movements of it are imparted to a breaking-down tool, of any appropriate shape, but preferably consisting (as shown) of a stem F of circular cross section terminating at its outer end in a head G, of cruciform section, detachable and formed with a screw-thread adapted to engage with a corresponding thread formed on the stem. The fluid is exhausted through one of the pipes C, the valve B, and a pipe H, which may lead back to the source of supply. The cylinder is mounted on a carriage provided with wheels, so that the machine may be moved by hand from place to place as required; but means are provided whereby it may be anchored when in working position in relation to a furnace.

The cylinder is mounted in a universal bearing consisting of a clamp O supported by a yoke P, loosely held by a bolt and nut Q on a cross



Gill's Clinkerer for Gas-Producer Furnaces.

bar—the yoke being movable in a horizontal direction about the bolt, so that the cylinder may be swivelled from side to side. The cylinder may be swivelled in a vertical plane by rocking the clamp about the bolts. The movements of the cylinder are effected by a handle R; both this handle and the valve lever E being controlled by the workman in charge of the machine.

In order that the machine may be adapted to operate in furnaces having grates of various heights, the yoke is adjustably mounted. The clamp O and cross-bar rest upon bolts U passed through holes in the opposite limbs V of guideways upon the carriage. When in the lowest position (as shown), the cross-bar rests upon the lower U-shaped distance-pieces which separate the adjacent guideways V.

Anti-Dip Valves of the Cup-Type.

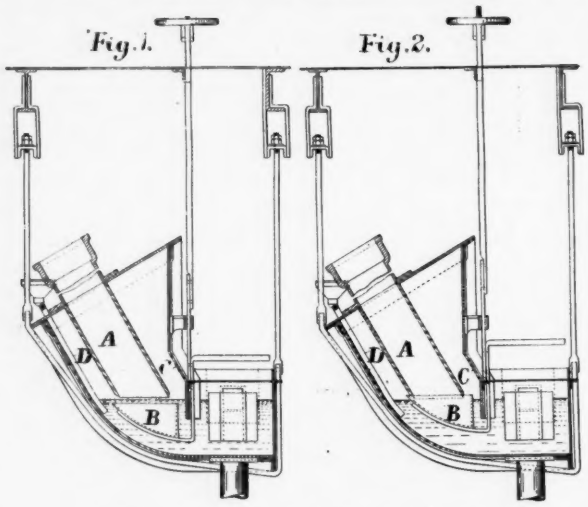
ROBERT DEMPSTER AND SONS, LIMITED, and TOOGOOD, H. J., of Elland.

No. 24,463; Oct. 26, 1912.

The object of this invention is "the provision of an improved anti-dip which shall be more universal in its applicability, and capable of after-adjustment to suit its varying environments and conditions."

With this in view, the operating device is formed in the shape of a letter J or U, passing under the curtain plate; one limb being in the atmospheric portion and the other in the gas portion of the main. The cup forming the anti-dip valve is arranged some distance above the bottom of the main, permitting the free flow of tar along the floor. The lifting rod is made with a lower detachable portion, so that the cup can readily be disconnected when it is required to clear out sediment.

It is claimed that by the use of this arrangement the surface of the liquid may be kept at a level (capable of adjustment to control the washing action) slightly below the edge of the gas down-take pipe, which is preferably knife-edged to prevent accumulation of pitchy deposit thereon. Thus "the hot crude gases issuing from the retort are caused to impinge and spread out fan-like over the surface of the liquid, whereby the washing action of the seal, or its equivalent, is retained."



Toogood's (R. Dempster and Sons) Anti-Dip Valves.

Fig. 1 is a vertical section of the main and dip pipe, showing the cup lowered clear of the pipe, but clear above the bottom of the main. Fig. 2 is a corresponding section showing the cup used as a seal. The main has an open continuous atmospheric lute and curtain plate; the lute being preferably provided with lids or covers. Beneath each down-take gas-pipe A (or group of such pipes) is arranged a vessel B capable of retaining liquid. To it is attached a bent rod, which passes under the curtain plate C from the hermetically sealed portion to the atmospheric portion of the main. For adjusting the level of the vessel, external means are provided, such as a hand-wheel and screw on the lifting rod detachably connected to the bent rod.

The liquid is supplied to the main through the pipe D. This arrangement gives freedom to work each retort, or group of retorts, independently. "For example, the anti-dip may be put into operation when the rich hydrocarbons are being distilled in the early period of carbonization, and during the latter period, when the coke is practically spent, the seal may be put on that particular retort, or group of retorts, whereby the last traces of volatile matter may be distilled from the coke without the risk of drawing in furnace gases; also the seals can be re-adjusted to compensate for any settlement of foundation."

Co-Partnership at Watford.—In the course of the remarks of the Chairman of the Watford Gas Company at the recent half-yearly general meeting, as reported in the "JOURNAL" last week, he mentioned that the accounts showed that the co-partnership system benefited both employers and employed. According to the report of the Committee for the year ended the 30th of June (the fourth), the bonus and interest divided among the members of the fund amounts to £533—being an increase of £52. A sum of £2170 of the Company's "B" stock has been purchased since the commencement. Of this amount, £1795 has been allotted to the co-partners; leaving a balance of £375 in the hands of the Trustees. This stock will be divided among the members who have a sufficient amount standing to their credit in the fund in October next. There were 107 co-partners on the 30th of June.

MISCELLANEOUS NEWS.

PRESENTATIONS TO MR. J. G. TOOMS.

Farewell Supper in Waterford City Hall.

On Saturday, the 30th ult., a signal compliment was paid to Mr. J. G. Tooms, who, as already announced in the "JOURNAL," has relinquished the management of the Waterford Gas-Works to take the position of Engineer of the Primitiva Gas Company of Buenos Ayres, for which place he left England last Friday. On the occasion above referred to, he was the recipient of no less than three presentations. The Directors of the Gas Company, in addition to offering a handsome and costly gift to Mr. Tooms, provided a farewell supper, to which not only all the employees were invited, but a number of Mr. Tooms' well-wishers. The other presentations were from the staff and employees and the South-East of Ireland Gas Managers' Association; and the three gifts served to show in a tangible way the esteem and respect in which Mr. Tooms is held by his superiors, by his professional colleagues, and those who were subordinate to him in office. During the thirteen years in which he occupied the position of Manager of the gas-works in Waterford, Mr. Tooms demonstrated his capability and efficiency for the post. Many improvements were effected at the works under his personal supervision; and his administration, carrying with it the approval of the Directors, was marked by a keen perception of business methods and all the attributes that go to make a concern a modern and successful one. If there was one feature strikingly marked during the connection of Mr. Tooms with the Company, it was the kindly relations that existed between him as Manager and the other employees of the Company; and this was corroborated to the fullest extent at the recent supper—Directors, social friends, and workmen voicing to their esteem for a friend who served his masters faithfully and well, who was agreeable to his associates, and who recognized the arduous labours of the workmen by accomplishing much for their present and future welfare. His departure to a foreign land is greatly regretted in Waterford. Regret, however, is mingled with pleasure; for it was admitted, on the occasion of the farewell supper, that the appointment which Mr. Tooms had obtained is a recognition of his sterling abilities, and the general hope was expressed that in his new sphere he would meet with the success and prosperity he richly deserves.

Mr. A. NELSON, D.L., a local Director of the Company, occupied the chair, having on his left Messrs. J. G. Tooms, J. F. Tyndall (Wicklow), William Farrell, John Power, and John Hearne (a member of the Town Council), and on his right the Mayor (Alderman R. Power, J.P.), and Messrs. R. Bruce Anderson, J. Paterson (the new Manager), and E. Walsh.

After supper,

The CHAIRMAN proposed "The Health and Prosperity of the City of Waterford," coupling with the toast the name of the Mayor.

The MAYOR having responded,

Mr. E. WALSH submitted "The City of Waterford Gas Company," coupling with the toast the name of Mr. Anderson. He said that Mr. Anderson came of a family who were long and honourably associated with the gas business—not only in Waterford but the world over. The name of his respected father, whose death occurred recently, which they regretted—and he took this opportunity of tendering to Mr. Anderson their sincere sympathy on the occasion—was one to conjure with in the profession. He was identified with improvements of every kind, as they were all aware, and he need only mention his name and the name of his respected son, to call forth the welcome they had now tendered to him. As a corporator, he (Mr. Walsh) had often had to fight battles against the Company, and they fought them hard; but this he must say, that the Company did not take any unfair advantage. As business men they made the most of their position; but they were honourable opponents, and when all was said and done they could shake hands over it.

The toast was enthusiastically honoured.

Mr. ANDERSON, on rising to reply, was very cordially received. On behalf of the Company and on his own behalf, he thanked all present for the hearty manner in which they had received the toast. Referring to the history of the Company, he said the works were originally built by a family named Walpole. The undertaking had a chequered existence; and then it came into his father's hands in the year 1854. From that time onwards it had an uninterrupted history of progress and success. The Company always earned good profits; and he thought these had been greatly due to the amicable relations that had always existed between the staff and the employees. His father's motto always was to treat those who had to work for him kindly, and he was sure that they would treat him kindly in return. This was one thing he always instilled into his managers; and he (the speaker) thoroughly appreciated the wisdom of the sentiment, and had endeavoured, to the best of his ability, to follow in the footsteps of his father in this respect. He gave particulars of the changes which had been made in the works since he became intimately associated with the management of the Company in 1887. All the reconstructions were effected to a great extent by themselves; and Mr. Tooms, who was sent to take charge of the alterations, carried them through with the greatest success. Having referred to the formation of the Company's provident association and to the profit-sharing scheme, the speaker concluded by thanking the Company for what they had done, and those present for the kind way in which the reference to his father had been received.

THE PRESENTATION.

The CHAIRMAN said they had now arrived at the most interesting part of the evening's function. Their gathering was mainly for the purpose of giving evidence of their appreciation of the services rendered by Mr. Tooms to the City of Waterford Gas Company during the last thirteen years. They had before them evidence in a tangible form of the Company's appreciation. They had heard through Mr. Anderson such a *résumé* of the work done by Mr. Tooms, that it would be almost out of place if he continued to refer to his services in full; but they

who were interested in the Company felt that they were about to suffer a serious loss and deprivation of the services of one who had made himself so useful and so valuable, and so popular in Waterford. He thought what they had exhibited there that evening was evidence of their appreciation of his worth, and did the Company no discredit. He was sure it only in a very small way gave expression to the sterling estimation in which Mr. Tooms had been held. He might mention that associated with the Company's presentation there was to be an address and presentation on behalf of the employees; and there was also a deputation from the South-East of Ireland Gas Managers' Association, who would present Mr. Tooms with evidence of their esteem. He asked all present to drink to the health, prosperity, and success of Mr. Tooms. He was going a very long way from Waterford. He had been appointed to a position that did him credit. It also reflected credit on the City of Waterford Gas Company, and he thought especially on Mr. Anderson. Mr. Tooms was going to the Argentine Republic carrying with him the best, sincerest, and heartiest good wishes of all who had the privilege of his acquaintance while in Waterford.

The toast having been honoured,

Mr. JAMES NEARY, as Chairman of the Presentation Committee, said it afforded him the greatest pleasure, and at the same time the deepest regret, to be present that night. He had known Mr. Tooms since he came to Waterford some thirteen years ago, and he had served under many masters; but to find one equal to him would be an impossible feat. He asked Mr. and Mrs. Tooms to accept the address and silver dishes as a small token from the employees of the Gas Company, which he hoped would bring many happy remembrances back to them when they were far away from old Ireland. He wished Mr. Tooms and his family every success in the land of their adoption.

Mr. J. HARRIS, the Hon. Secretary, read the address, which was beautifully illuminated, as follows:—

To JOHN GRICE TOOMS, Esq., A.M.I.M.E.

We, the staff, fitters, and workmen of the City of Waterford Gas Company, cordially unite in conveying to you our sincere congratulations on your appointment, as Engineer to the Primitiva Gas Company, Buenos Ayres, and in asking you and Mrs. Tooms to accept the accompanying silver dishes as a memento of our warm regards. We venture to express the wish that the future of you and your family may be crowned with all happiness and prosperity. May the perusal of this address at all times recall many pleasant reminiscences.

[The address bore the signatures of the Committee and subscribers.]

Mr. H. SMITH, Mr. T. KIELY, and Mr. J. POWER, representing the staff, the fitters, and the lamp-lighters of the Company, respectively, having offered a few remarks and expressed their good wishes for Mr. and Mrs. Tooms and the family,

Mr. J. PATERSON said he had been selected as the medium for making a small presentation to Mr. and Mrs. Tooms, on behalf of the South-East of Ireland Gas Managers' Association, who often used to meet in Waterford, and spend some happy days and evenings there. He asked them to accept the gift as a very small token of the esteem and regard in which Mr. Tooms was always held by each and every member of the Association; and in doing so he could only wish them and their family long life, the best of health, and every success in the new sphere to which they were about to depart.

The presents were placed on a table in front of the Chairman. The Company's gift was a canteen of silver, and those of the employees and the Association were silver dishes.

MR. TOOMS' REPLY.

Mr. TOOMS, on rising to acknowledge the gifts, was enthusiastically received with musical honours. In a long speech, he expressed his indebtedness to the Company, not only for their present and their magnificent send-off, but for their uniform kindness and consideration. He said that he would treasure the presentation more on account of the sentiments it conveyed as to the satisfaction felt at his conduct and work for the Company than for the intrinsic value of the gift. As to the staff and men, he hardly knew how to express his feelings. His long intercourse with the men had been, on the whole, one of the happiest times of his life. He could not find words to tell them how sincerely he appreciated the presentation they had been so kind as to make to him. He was pleased to know that the conditions under which all the men, and also their wives and families, lived had materially improved. Coming to the gift of the Association, he said he valued it very highly. He added that a week or two previously the Irish Association of Gas Managers had also made him a present. He said he was sorry to leave Ireland; but, in the interest of his family, more than in his own, he had for some years been desirous, if possible, of improving his position. Through the recommendation of his friend and chief, Mr. Anderson, he was able to secure the much-coveted position of Engineer of the Primitiva Gas Company of Buenos Ayres. It was only meet and proper that he should publicly and in the presence of them all say how grateful he felt to Mr. Anderson for having recommended him as strongly as he did to his future employers. In conclusion, Mr. Tooms made complimentary reference to his successor, Mr. Paterson, and said he was sure that the Company were going to succeed and achieve far greater success than any of them had any conception of. Mr. Paterson had been identified with Mr. Anderson's works longer than he (Mr. Tooms) had. He had known him intimately for fifteen years; and he was sure that so long as the men did their duty each and all would receive as much consideration as they had received from him—possibly more. He was quite confident they would always have one aim—the prosperity and success of the Company, secure in the knowledge that they would always be treated fairly and justly, and that in their old age, if faithful servants, they would be looked after.

Other toasts were "The New Manager," and "The Chairman."

Mr. PATERSON, in reply, expressed the hope that the same relations which had existed between Mr. Tooms and the staff would continue in future.

During the evening, vocal and instrumental music was performed by a number of those present.

METROPOLITAN GAS COMPANY OF MELBOURNE.

The Seventy-First Ordinary General Meeting of this Company was held on the 26th of July—Mr. J. GRICE (the Chairman) presiding.

The Directors in their report, which was briefly noticed last week, stated that the net profits for the half year ended the 30th of June, including a balance of £31,940 brought forward, amounted to £132,060. From this sum they had transferred to the reserve fund account £26,000, to the meter renewal fund £4500, and to the gas-stoves, &c., account £3000. They recommended the payment of a dividend at the rate of 6s. 6d. per share, amounting to £55,718; leaving a balance of £42,841. They announced that they had decided to make a further reduction in the price of gas. The price has now been reduced from 4s. 7d. to 4s. 4½d. per 1000 cubic feet, as from the July readings of the meters.

DEATH OF THE CONSULTING ENGINEER—RESIGNATION OF THE VICE-CHAIRMAN.

The CHAIRMAN, in moving the adoption of the report, said: Before commencing the business of the meeting, I will refer to the death of Mr. R. O. Thompson, M.Inst.C.E., who was for twenty-eight years Engineer, and for six years Consulting Engineer, of this Company. Mr. Thompson came out as Engineer to the Company's South Melbourne works, but afterwards took sole charge of the West Melbourne, South Melbourne, and Fitzroy works. The services he rendered to the Company were very great, and were highly appreciated by the Directors; and we deeply regret his decease. We have also lost, through resignation of his seat on the Board, the valued services of the Vice-Chairman, Mr. J. M. Pratt, who retired on account of ill-health. He was a Director of the Company for nearly twenty-two years, being Vice-Chairman for twelve years. He was very highly esteemed and liked by his colleagues, as his courteous manner endeared him to everyone of us. He gave us the best of his services, and there was no more regular attendant at his work than Mr. Pratt. Mr. J. M. Higgins, a gentleman well known to the business community of Melbourne, for his technical and financial knowledge, has accepted the vacancy thus created.

REDUCTION IN THE PRICE OF GAS.

It gave your Board pleasure, in the early part of this month, to announce a reduction of 2½d. per 1000 cubic feet in the price of gas, commencing with the July readings. You will remember that, for many half years prior to June, 1912, as it was necessary to provide very large sums of money, which, being for replacements of plant, had to come out of revenue, our profits could not be devoted to a reduction in price. Twelve months ago we began to see the end of this portion of our present expenditure; and we at once fulfilled our promise that we would make a reduction in price as soon as practicable. The price was then lowered by 5d. per 1000 cubic feet on gas for lighting and heating purposes, and our revenue, and consequently our profits, during the twelve months ending June 30, 1913, suffered to the extent of £44,844. By the reduction, the price of gas was brought down to 4s. 7d., which was equal to the lowest rate at which it had ever been sold in Melbourne. The present further lowering of the price means that it is now being sold at 4s. 4½d.—that is, 2½d. less than our previous minimum. Your Directors anticipate that this will involve a further depletion of annual revenue of about £25,000. These two concessions to gas consumers will amount to £70,000 during the next twelve months. We have also to meet higher freight under our new coal contract, which will represent extra expenditure of about £15,000 per annum during the next three years. Men who talk glibly of the small reductions made in the price hardly realize, on the reading of a single meter, what these concessions mean to the Company, inasmuch as it has to be multiplied by the total number of our meters affected. We hope, should our business continue to improve, to be able to make further reductions in the future.

THE WORKING IN THE HALF YEAR.

Referring, now, to the business of this meeting, it gives me pleasure to say that the output of gas has materially increased during the half year; our total sales being 1237 million cubic feet—the highest sales for any half year in the history of the Company—and amounting to 132 million cubic feet over the June half of 1912, representing an increase of 12 per cent. We received from the sales of gas for the half year £276,338, against £266,349 for the corresponding period of last year. In taking these returns into consideration, you will bear in mind that the price of gas for the past year was 4s. 7d. per 1000 cubic feet, as compared with 5s. in June, 1912. Our sales of residual products amounted to £72,055, compared with £66,322 for the same period of last year. There is no special reference necessary to the items on the expenditure side of the revenue account. It is true they have increased, owing principally to the greater quantity of coal used and the higher rate we have to pay for coal under the new contract. As regards increases in other items, we must expect these, as we are each year doing more for our customers. I may mention, however, that under the head of "Repairs and maintenance of works" a provision of £10,000 is made for special renewals at the West Melbourne and South Melbourne works, which will be carried out within a moderately short time. Referring to the appropriation of the profits, the Directors have transferred about the usual amounts for depreciation of meters and stoves, and to the reserve fund; and they recommend for your adoption a dividend at the rate of 6s. 6d. per share, which, though 13 per cent. on the nominal paid-up capital, is equal to only 8·42 per cent. on the total capital paid into the Company by the shareholders. The number of meters fixed on June 30, 1913, was 127,450, as compared with 117,397 in 1912—an increase of 10,053. As regards cooking-stoves, the half year shows an additional 4697 in use; the number sold having increased by 5081, and the number leased having decreased by 384. Cooking by gas is now recognized by the public as being much superior, both in large and small establishments, to any other method; and the two reductions in price to which reference has been made make comparisons with other fuels still more favourable to gas. The saving in labour, the cleanliness, and the economy, combined with the abolition of the smoke nuisance, make it certain that in future very

nearly all cooking in cities will be done in this manner. This has proved itself so well to the 60,000 consumers in Melbourne and the suburbs who now cook by gas, that the only necessity for reference to it is to show one of the principal directions in which the business of the Company is expanding.

VALUE OF GAS APPLIANCES.

It has taken a longer time to educate the gas consumers up to the fact that a modern gas-fire is the easiest and the most cleanly means of heating rooms; but this fact is gradually becoming recognized. Our returns show that there has been a largely increased demand for gas-fires, as we have sold and fixed 1484 during the past half year, compared with 762 for the six months ended June, 1912. Special inspectors were appointed by the Company to see that all fires were in good working order at the beginning of the winter; and this enabled us to point out and condemn some of the obsolete patterns of fires. There has been, in the past, much talk about the deleterious effects of gas-fires, attributable to carbon monoxide. In reply to that, I quote an extract from the "JOURNAL OF GAS LIGHTING" for the 17th of June last:

> As the result of the experiments on gas-fires made by the Leeds University, it was reported that no carbon monoxide escapes under ordinary conditions into the room, and very little is ever found in the flue.

A second extract, taken from the April number of the "Public Health Magazine," is also on the subject of gas-fires. In a report of a lecture on "Smoke Abatement" delivered by Mr. W. L. Hawksley, M.B. and D.P.H., Assistant Medical Officer of the Board of Health, and acting Chief Tuberculosis Officer of the City of Liverpool, the following paragraph appeared:

> During the last few years, great improvements have been effected in connection with gas-fires, and much prejudice against their use has been removed. If properly fixed, and used under hygienic conditions, gas-fires are economical and satisfactory. They are specially suitable for bedrooms and rooms occasionally used. The various gas companies have done a good deal for smoke prevention, and the extent to which they have assisted in this matter may be estimated when it is mentioned that in the Metropolis alone no fewer than 1,300,000 cooking and heating appliances are now served by the gas companies.

Another help to our sales of gas is the bath-heater, the comfort and convenience of which in a house is undoubted. During the past half year we sold 348, which number is 25 per cent. in advance of those sold for the whole twelve months of 1912. In the case both of gas-fires and bath-heaters, we have arranged that our customers can purchase these on very favourable terms, and also on the hire-purchase system. As regards smaller appliances—gas-irons, mantles, and burners—about the same number of sales has taken place as during the corresponding period of last year. The fact that we have sold 10 per cent. more incandescent burners to customers is a proof that, notwithstanding competition by electricity, our lighting business is still making substantial progress. It is true that somewhat fewer mantles have been disposed of; but we attribute this to the fact that the mantles we are supplying are each year improving in quality. The officers of our fittings department, speaking with expert knowledge, consider that consumers waste their money by buying cheap mantles, which prove the dearest in the long run. These articles also tend to discredit gas lighting by making it more costly.

EXTENSIONS OF MAINS.

One result of the very rapid increase in our business during the past few years has been to prove the necessity for providing larger trunk mains in various districts. Consequently, the distribution department has been particularly busy. [The Chairman mentioned the districts in which the extensions of mains had been carried out.] The cost of the principal mains laid during the six months amounted to the large sum of £18,748.

ADDITIONAL DESSAU VERTICAL RETORTS.

At our last meeting, I intimated that we had, unfortunately, been delayed in getting the new installation of Dessau vertical retorts at West Melbourne into action. Two-thirds of the plant is, however, now making gas, and in the course of a month or so it is anticipated that the whole installation will be in regular work. The retorts on this principle at the South Melbourne works have been running continuously for the past twelve months, and have given every satisfaction. By means of these retorts, we are able to obtain a larger quantity of gas per ton of coal carbonized than is possible in the older forms of carbonizing plant, without any reduction in the illuminating or heating power of the gas supplied notwithstanding statements to the contrary. In addition to this, there is a distinct improvement in the quality of the residuals obtained. The coke made from the Maitland coal, which we now carbonize almost entirely, though somewhat less in quantity, is so far improved in quality that it commands a higher price than the ordinary coke—it being specially suitable for foundry and manufacturing purposes. Having proved the value of the Dessau vertical installations by results, and in order to keep abreast of fast-increasing demands, your Directors decided to increase the carbonizing plant by installing eleven additional beds of retorts at the South Melbourne works during the coming summer. The contract has been placed for these, together with the necessary accessory plant, at a total cost of £105,500 erected. These, when added to the five beds already in use, will make the installation one of sixteen beds. This will take the place of the remaining retorts on the old direct-fired principle, and will complete South Melbourne as a manufacturing station.

EMPLOYEES' PAY AND CONDITIONS OF WORK.

A plaint lodged in the Industrial Court of Conciliation and Arbitration by the Federated Gas Employees' Union, and served on the Company and other gas companies, was before the Court during the half year. Your Directors, having at all times endeavoured to meet the reasonable demands of its employees, both as regards pay and conditions, considered the demands made by the Union unreasonable, and they therefore had their views placed before the Court through the Company's Engineer (Mr. Philip Holmes Hunt, M.Inst.C.E.). Though a number of matters have been settled, no award has yet been made in regard to the wages of these employees.

LEAVE OF ABSENCE FOR THE SECRETARY.

It was felt by your Directors that Mr. Hinde, your Secretary, needed a rest after his arduous labours, which had been increased so much by outside matters, such as the work involved in presenting our case to the Gas Inquiry Board, that they asked him to take six months' leave of absence; and he is now on a visit to Europe. I would like to say that the working of the Company's business has been conducted in the usual efficient manner.

SOME APPRECIATIVE REMARKS.

Mr. JAMES PHIPPS seconded the motion. In doing so, he said that he fully endorsed all that had been said with regard to the loss of Mr. R. O. Thompson; and he congratulated the Directors and shareholders on the appointment which had been made in his place. The action which the Directors had taken with regard to the Secretary was a just one; and the manner in which they and the officers had gone through a very trying ordeal in the inquiry which had been demanded by a section of the Press into the affairs of the Company reflected great credit on everyone connected with it. Mr. Hunt, the Engineer, and the officers connected with him, had rendered splendid service at the South Melbourne works. The amount of money which would be saved through the erection of the new plant there would be very large. In Mr. Hunt, the Company had a first-class officer; and the manner in which he had carried out his duties reflected the highest credit upon him. The way in which the employees had worked under him also showed that he possessed a wonderful personality. So far as the trade the Company were doing was concerned, he knew that in the northern suburbs a great work was being done; while in the southern suburbs every effort was being made to meet the requirements of the people who lived there. However, the demand was so great that it would need a very large outlay on the part of the Company before all the requirements in this direction could be met. The laying-down of low-pressure and new mains was an excellent thing, for the better supply which would thus be made available, together with the greater area which would be served, would encourage people in the suburbs, where building was being freely carried on, to patronize the Company instead of utilizing other forms of lighting. Every shareholder should be pleased with the balance-sheet, and also with the actions of the Directors and officers of the Company. From personal knowledge, he could say that the officers and employees were as fine a body of men as ever existed in the Commonwealth.

ADOPTION OF THE REPORT—THE DIVIDEND DECLARED.

The motion for the adoption of the report having been agreed to,

Mr. J. S. WALKER moved that the dividend recommended should be declared. In doing so, he said it must be very gratifying to the Directors and shareholders alike to think that a dividend of 6s. 6d. per share could be recommended, notwithstanding the vast expenditure which had had to be undertaken in the erection of the new vertical retorts. There was good reason to be satisfied with the way in which the Directors had conducted the affairs of the Company.

Mr. RAYNES DICKSON, in seconding the motion, said that, had it not been for the foresight of the Directors and the patience of the shareholders, much of the money which had been devoted to reconstruction works might have been paid away in dividends. The results which had now been obtained, however, showed that the actions of the Directors had been more than justified. It was obvious, too, that the Company had faithfully carried out the Charter which had been granted to them by the State Parliament.

The motion was agreed to.

THANKS TO THE CHAIRMAN AND DIRECTORS.

On the motion of Mr. EDWIN PHILLIPS, a cordial vote of thanks was passed to the Chairman and Directors for their services.

The CHAIRMAN, in thanking the meeting, said he was very glad to know that the shareholders approved of what had been done. The Directors, on the other hand, had to thank the shareholders for the self-restraint which they had exhibited in not forcing on them the distribution of the whole of the profits. The Company could not have got on with the work in the way they had done, nor could the plant have been placed in the good order in which it had now been put, if the shareholders had insisted on the distribution of the money in dividends. The money had not, however, been put into the reserve. It had merely been used for replacing plant. If the shareholders had been insistent, the Directors could not have accomplished what had been carried out.

The proceedings then closed.

HARROW AND STANMORE GAS COMPANY.

Continued Growth in Consumption.

The Ordinary Half-Yearly Meeting of this Company was held on Monday of last week, at the Holborn Restaurant, W.C.—Mr. ALFRED H. BAYNES, J.P., in the chair.

The SECRETARY AND ENGINEER (Mr. J. L. Chapman) read the notice convening the meeting; and the report of the Directors and the statement of accounts for the six months to June 30 were taken as read.

The CHAIRMAN remarked that it was with pleasure the Directors again met the proprietors with such a satisfactory balance-sheet—indicating, as it did, a considerable increase of business and a progressive outlook. If they would bear with him for a short while, he would like to bring to their notice some of the figures of the past half-year's working. Turning to the capital account, on the credit side an issue had been made of the last portion of the additional capital under the Act of 1904. This sold at satisfactory prices, and brought in premiums of £1980. On the debit side, £4806 was for the completion of the new retort-house, with the cost of fitting up with modern machinery, and £970 for new mains. The cost of the new meters and stoves amounted to £1932, and had been written off by the depreciation of £1925. In

the revenue of the Company there had been satisfactory increases. The receipts from gas alone had been more by £1914; meter, stove, and fittings rentals were more by £331; and the residuals receipts were up by £1250—all as compared with the corresponding period of the previous year. This showed an increase in receipts of £3500, and gave total receipts of £32,851. On the expenditure side, coals (of which 1687 tons was the increased quantity used, as compared with the same half of last year) had cost more by £1358. Oil had been sparingly consumed; and the quantity was less by 15,654 gallons, and had cost less by £180. Coke for the manufacture of carburetted water gas, though less had been used, had, at the higher value, cost exactly the same. Carbonizing wages had gone up by £110, some portion of which was due to changing over into the new retort-house. Repair and maintenance of works was also higher by £731; but £350 of this was the amount that was written off for two cottages taken down to make room for the new works. Mains, meters, and stoves had been well maintained at a further cost of £611. The whole of the new services, and the fitting up of prepayment installations, had been charged again to revenue. Rates and taxes had increased by £177; and rents were higher, owing to the opening of the new show-room in the centre of the district. On the other hand, bad debts showed a decrease. The Directors had thought it wise, under the powers of their new Act, to charge to the revenue account the costs already incurred for the parliamentary work. The amount for the co-partnership scheme, which was now in working order, had somewhat increased. The result was that the total expenditure was higher than at the same period of last year by £3419—amounting to £24,870. The profit for the half year, at £7981, was £81 more than for the corresponding period of 1912; but it must also be remembered that £651 had been paid out of revenue for the costs of the new Act. After payment of dividends as recommended in the report, and the debenture stock interest, and adding £531 to the reserve fund, there would be £31 to carry forward. This sum, added to the previous balance, made a total amount in hand of £6113. With the addition of the sum already mentioned, the reserve fund would amount to £5692. As compared with the same half of last year, the increase in the sale of gas had been 12,155,000 cubic feet, which was equal to 9·28 per cent. Notwithstanding further outlay, the capital expenditure in relation to the business done had been again reduced, and now stood at 17s. 3d. per 1000 cubic feet of gas sold. The Directors felt great satisfaction that the Bill deposited by them in Parliament in the autumn of last year had received the Royal Assent, and that there had been no opposition from the local authorities. They knew it to be an exceedingly good and useful Act for the shareholders, the consumers, and the employees; and they were sure the proprietors would feel that they had in it something which would enhance their property and be to the advantage of all concerned. In connection with this matter, the Board deemed it only right that the shareholders should know of the specially valuable services rendered by their Secretary and Engineer in regard to the application to Parliament; and they were confident the proprietors would join with them in congratulating Mr. Chapman on the successful result obtained. In conclusion, he moved the adoption of the report and accounts.

Mr. SAMUEL CUTLER having formally seconded the motion,

Mr. E. L. BURTON said the accounts appeared to him to be excellent; and he was glad to see it had been possible to get the capital down. The returns from residuals were very good—about 62 per cent. of the total cost of materials carbonized; and the Engineer was to be congratulated upon this. About 13d. per 1000 cubic feet had been spent on repair and maintenance charges; and he was sure the shareholders would support the Board in this policy, because by this means capital expenditure could be kept down. He was also pleased to see the charging of parliamentary costs to revenue account. It was rather an uncommon thing at the present time; but it was a course which he hoped would be followed more often in future, rather than to charge to capital account the costs of Acts of Parliament which produced not a penny more profit, valuable as they might be to the undertaking.

Mr. H. PARDY also made some complimentary remarks on the management of the undertaking, and expressed cordial agreement with all the last speaker had said.

The resolution was then put and unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. CUTLER, dividends were declared for the half year at the rates of 11 per cent. per annum on the original "A" capital, £7 14s. per cent. on the additional "C" capital, and 7 per cent. on the additional "B" capital and the guaranteed shares—all less income-tax.

Moved by the CHAIRMAN, and seconded by Mr. CUTLER, it was agreed that £531 4s. 9d. should be placed to the reserve fund.

Mr. A. F. PHILLIPS, in proposing a vote of thanks to the Secretary and Engineer and the staff, said Mr. Chapman had had a great deal of anxiety in connection with the passing of the Company's Bill through Parliament, and deserved the congratulations and thanks of the shareholders in this matter. He believed he was right in saying it was mainly owing to Mr. Chapman's efforts and the discussions he had with the local authorities in the district that opposition to the measure was avoided. The Act would be of great advantage to the Company. The other members of the staff had also worked zealously in the interests of the undertaking.

Mr. F. J. BANCROFT seconded, mentioning that he was at Harrow at the first meeting in connection with the co-partnership scheme, and had been struck with the cordial relations which existed between Mr. Chapman and the whole of the staff. These relations were, he felt sure, reflected in the very good reports which the shareholders received half year after half year.

The vote was heartily carried, and acknowledged by

Mr. CHAPMAN, who said it was a great pleasure to feel that he had about him men whom he had practically brought up from boys. He had been connected with the works for something like fifty years; and there was a man there now who must have been there forty-five years. Every effort was always made to give old men work of some kind that they could do. This was a matter in which the Directors gave him a perfectly free hand.

Mr. A. W. OKE proposed a vote of thanks to the Chairman and Directors; and this was seconded by Mr. E. W. DREW, unanimously carried, and acknowledged by the CHAIRMAN.

Issue of Further Capital Authorized.

The meeting was then made special, and

The CHAIRMAN moved—"That the Directors be authorized to issue £30,000 of ordinary or preference stock and to borrow on mortgage or by the creation of debenture stock £10,000 in respect of such stock, in pursuance of the Acts of Incorporation, in such manner and at such times as they may deem best."

Mr. BANCROFT seconded.

Mr. OKE remarked that it was an excellent proposal that the Directors should be at liberty to issue either debenture stock or mortgage bonds. They might be able to attract investors who would be willing to take up bonds, but perhaps not at the moment prepared to take up debenture stock. It would be reviving a source which in former times was found useful to gas companies, but which of late had been left somewhat in the background.

The motion was put and carried without further discussion.

WORTHING GAS COMPANY.

Settlement with Mr. Schweder.

The Half-Yearly General Meeting of this Company was held on the 30th ult.—Mr. H. H. GARDNER (the Chairman) presiding.

The report presented by the Directors showed a balance of £21,844 on the profit and loss account for the six months ended the 30th of June; and they recommended the payment of a dividend of £5 5s. per cent., less income-tax, on the consolidated ordinary stock of the Company.

The CHAIRMAN, in moving the adoption of the report, said the balance showed a half year of record success, which was largely contributed to by the fact that the coal contracts were running at the old prices, and residuals were maintaining their enhanced value. The capital account expenditure till the end of 1912 was £136,960. During the past half year they had spent a further sum of £1010, but had written £1353 off the depreciation on meters, stoves, and fittings. This left the capital account at £136,617. Coming to the revenue account, the Chairman said that coal had cost £8157, in comparison with the £9036 for the corresponding period of 1912. This substantial reduction of £879 was accounted for by the fact that they had had no coal strike to contend with. He did not believe the present inflated price of coal would be long continued; and signs were not wanting that more reasonable figures could not be very long deferred. The total expenditure on revenue account for the half year was £15,505, against £16,832 for the corresponding period of 1912. There was an increased profit of £2000 (£5760 against £3760). They had 2990 ordinary consumers and 3608 slot-meter consumers, with 5196 cookers, &c., in use. He expressed their indebtedness to the Engineer and Manager (Mr. W. A. Walker), and then proceeded to touch upon the Bill referred to in the last half-yearly report. He said they had secured the passing of the Bill as an unopposed measure by paying Mr. Schweder £1000 as the agreed amount of compensation which he was to receive under the terms of these provisions; and they had thereby also saved very considerable parliamentary expenditure, and obtained additional and very desirable facilities for the laying of the present and future mains and works through his tunnel. They had been assured, and had no reason to doubt, that the protracted controversy with him was now happily ended—a consummation which they had all along desired. They had given instructions to proceed with all diligence with the erection of the new holder which was so much required, and the connection of it with the present works.

Alderman PATCHING seconded the motion, and in doing so pointed out that after providing £2000 estimated expenditure in connection with the Bill, and making allowance for depreciation to the amount of £1353, they would pay the full dividend and carry forward a balance only £117 less than they brought from the previous half year. This extremely successful result was largely due to the fortunate circumstances that they were, after much anxious negotiation, able to effect particularly advantageous contracts for coal.

The report was unanimously adopted, and the dividend recommended was declared.

ILFORD GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on Monday last week—Mr. W. ASHMOLE (the Chairman) presiding.

The SECRETARY (Mr. G. H. S. Iorns) having read the notice convening the meeting, the report of the Directors, with the accounts for the six months ended the 30th of June last, was presented. The report set forth that there had been a satisfactory increase of 5·45 per cent. in the quantity of gas sold as compared with the first half of last year; and the accounts showed a sum of £27,904 available for distribution. The Directors recommended the declaration of a dividend for the six months at the rate of £7 12s. 6d. per cent. per annum on the "A" and "C" stocks, and of £6 2s. 6d. per cent. per annum on the "B" stock, subject to income-tax. After paying the dividends, the balance would, in the opinion of the Directors, justify a reduction in the price of gas from Christmas to 2s. 7d. per 1000 cubic feet to ordinary consumers, and an increase to 7d. per 1000 cubic feet in the return to those on the prepayment system.

The CHAIRMAN, in moving the adoption of the report and accounts, said it was gratifying to the Board to submit to the shareholders such good returns. The increase in the sale of gas, though only 5·45 per cent. compared with the corresponding half of last year, represented approximately 23½ million cubic feet on the whole year's consumption. Passing on to analyze the items in the accounts, the Chairman said the total revenue was £43,330, compared with £40,213; and the total expenditure £30,316, against £28,667. The balance available for dividend—£27,904—was the highest in the history of the Company. In view of the favourable position of the undertaking, the Directors thought they could with confidence reduce the price of gas by 2d. per 1000 cubic feet from Christmas next. It might be claimed that this

reduction was actually of greater benefit to the consumers than appeared at first sight. The large increase in the cost of household coal could be greatly reduced by the use of gas fires, cookers, coppers, water-heaters, &c. The consumer was therefore not only saving labour, but also the increased price he would have to pay for coal. He entirely agreed with the suggestion made by so many chairmen of gas companies that some steps should be taken by Government to protect the home consumer of coal, either by a duty to be imposed upon all coal exported, or in some other way. With regard to the works, they had been kept in thorough repair, and the whole of the apparatus was in excellent condition and well up-to-date. The carbonizing plant, however, required extension; and the Board would give early consideration to the various installations of vertical and other retort-settings and coal-handling plant, so as to secure the most efficient system. Having given some figures to show the progress of the Company's business during the half year, the Chairman concluded by directing attention to the forthcoming National Gas Exhibition, tickets for which would, he said, be supplied to the consumers free of charge. It was hoped that the exhibition would prove a great success, and promote a closer and better understanding between gas companies and their customers.

Mr. MUMFORD seconded the motion; and it was carried unanimously.

The dividends recommended were then declared.

The CHAIRMAN next submitted a motion to increase the salary of the Secretary, by such instalments as the Directors might from time to time determine, to a sum not exceeding £600 per annum.

Mr. A. A. JOHNSTON (a Director) seconded the motion, which was supported by Mr. G. L. BURTON, and carried unanimously.

A vote of thanks was then accorded to the Directors.

The CHAIRMAN, in acknowledging it, proposed a similar vote to the officers, staff, and workmen. He remarked that the employees were apparently satisfied; and he thought the co-partnership scheme tended to make them contented.

The ENGINEER (Mr. W. B. Farquhar) and the SECRETARY responded; the latter thanking the Chairman, Mr. Johnston, and Mr. Burton for the support given by them to the motion with regard to his salary.

A vote of thanks to the Chairman brought the proceedings to a close.

HASTINGS AND ST. LEONARDS GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Thursday—Dr. G. G. GRAY (the Chairman) presiding.

The accounts for the six months ended the 30th of June showed a profit balance of £13,199. A sum of £1000 had been written-off in respect of the old works and plant, £77 for depreciation of Consols, and £160 for gas-lamps discontinued. The Directors recommended that, after providing for all fixed charges and interest, dividends should be declared at the following rates per cent. per annum: £6 10s. on the 5 per cent. converted stock, £5 on the 3½ per cent. converted stock, and £6 1s. on the 5 per cent. additional stock—the balance to be carried forward. The quantity of gas made was 236,816,000 cubic feet, inclusive of 64,738,000 cubic feet of oil gas; and the quantity sold amounted to 223,460,200 cubic feet.

The CHAIRMAN, in moving the adoption of the report, remarked that the past half year had been somewhat uneventful. In fact, only two matters seemed to stand out prominently—one being the extension of the Company's business, and the other the continued increase in the cost of coal, which appeared only too plainly on the balance-sheet. But though the past six months had been uneventful, they had not been any the less gratifying. He thought that those who had studied the accounts would agree with him that, under all the circumstances, the results of the last half-year's working had been really satisfactory. In spite of the continued conversion of public lamps to electricity, there had been an increase of 5 million cubic feet compared with the consumption in the corresponding period of the previous year. The total sale for the six months came to 224 millions. Speaking in pounds, this meant that the gas sold produced £36,090; being an increase of £685 on the corresponding period of 1912. Coke showed an increase of £534; but there was a decrease in the case of the other residuals, particularly tar. The net increase of income for the half year was £993. The revenue amounted to £44,606. Turning to the expenditure, they found an increase of £1023. This, of course, was not so satisfactory; but it was inevitable. It was mostly due to the rise in the cost of coal, which represented £621. Then there was an increase in respect of wages of £107. The total expenditure for the year was £31,406. The profit balance was (within a few shillings) £13,200, which was quite sufficient not only to pay the statutory dividends in full but to write-off £1200, and leave a small balance to be carried forward. They had not only the increase in revenue, but, in spite of the advance in the cost of coal, they had been able to maintain their profit. The more they scrutinized the report and the more they considered the reports of other companies, the more they would agree that the result of the last half-year's working had been, under existing circumstances, very satisfactory.

Mr. A. W. OKE, in seconding the motion, remarked that, at a time when there had been so much difficulty with regard to the cost of coal and other materials, it was greatly to the credit of the Directors, Engineer, and all those working for the best interests of the shareholders, that they were able to submit such a satisfactory report.

The report was adopted.

The retiring Directors and Auditor having been re-elected, a hearty vote of thanks was accorded to the Chairman, officers, and staff for their services; and it was acknowledged by Dr. Gray and Mr. C. E. Botley (the Engineer and General Manager).

Gas Plant in Electricity Works.—At the monthly meeting of the Accrington Town Council on Monday last week, Alderman Higham, the Chairman of the Electricity Committee, said the gas plant at the electricity works continued to work very well indeed. This was a source of satisfaction to all of them; and they were to be congratulated on the success attending the venture.

MORE VERTICAL RETORTS FOR BELFAST.

Tender for £70,950 Accepted.

At the Meeting of the Belfast Corporation on Monday last week, the minutes presented by the Gas Committee contained a recommendation for the acceptance of the tender of West's Gas Improvement Company, Limited, at £70,950 for a vertical retort installation, capable of carbonizing 480 tons of coal per day.

Alderman CRAIG, in moving the adoption of the minutes, said that, as the Council were aware, a deputation was appointed by the Gas Committee in June last to visit several towns in England for the purpose of inspecting the different systems of vertical retorts. The deputation visited Manchester, Oldham, Birmingham, Hull, Liverpool, and Hebden Bridge. The Birmingham and Hull installations were of the Woodall-Duckham type, and the Engineers in those cities expressed themselves as satisfied with the working of the plants. In both cases the deputation noticed several improvements in design which had been made since their last inspection. The vertical retorts at Hebden Bridge were unfortunately not in use at the time of the visit. In Manchester, a small installation of Glover-West retorts had been at work for a number of years with very satisfactory results; and the Corporation were now having erected much larger plant, on the same system, capable of producing 4 million cubic feet per day. In Liverpool, the Gas Company had also decided to adopt the Glover-West system; and a 2½ million installation was now in course of erection. As the result of their investigations, the deputation were unanimously of opinion that the Glover-West installation was the best for their requirements, and they therefore recommended the acceptance of the tender of West's Gas Improvement Company for their next extension. The price was £70,950 for plant to carbonize 480 tons per 24 hours; the Woodall-Duckham figure being £61,984 for plant dealing with 420 tons per day. The difference in price was fully accounted for when they considered the extra quantity of coal carbonized by the Glover-West system; and the Committee had no hesitation in recommending the Council to accept the West Company's offer.

Mr. SQUIRE seconded the motion.

Mr. DORAN thought the Council were going rather fast. He thought if the matter were taken back and reconsidered, they might save £9000. The coke they had at present was unsaleable.

Alderman CRAIG said he could not take the matter back.

Mr. DORAN then moved, and Mr. GIBSON seconded, an amendment that the minutes as to the West Company's tender be sent back.

Mr. SQUIRE said the suggestion that there would be a loss of £9000 on the West installation was incorrect. They were paying more for the one installation than for the other. But there would be less cost in working; so that there was an actual saving. There was no ground for saying they could not sell their coke. The large stock of coke—larger than was satisfactory—was due to the circumstance that, owing to the high price of oil, they were making as little water gas as possible and consequently were using only a small quantity of coke for the purpose.

On a division, the amendment was lost by 24 votes to 7; and the minutes were adopted.

PONTEFRACT FINANCIAL AFFAIRS.

Local Government Board Inquiry.

An extraordinary condition of affairs was revealed at an inquiry held last week, by Mr. C. V. W. Lucas, the District Auditor, on behalf of the Local Government Board, into the accounts of the Pontefract Corporation. At a meeting of the Corporation last April, it was announced that the Borough Accountant (Mr. A. Gibson) had been suspended; and it was agreed that the office should be closed, and all books impounded for a thorough investigation by Messrs. H. W. & J. Blackburn, of Leeds, the Professional Auditors to the Council. Previous to 1910, Mr. Gibson was Joint Borough Accountant with Mr. S. M. Lowden. The inquiry was conducted, by request of the Corporation, into the whole of the accounts during the past five years.

The main facts of the case were placed before Mr. Lucas by Colonel J. R. Shaw (the Mayor of Pontefract), who said it was necessary, in making the investigation, to go back to the year 1904 or 1905, when Mr. Stewart Lowden was elected Mayor. For many years he had been Borough Accountant, which position he resigned on becoming Mayor. The understanding, he believed, was that when Mr. Stewart Lowden became Mayor his son, Mr. Mark Lowden, should take his place as Borough Accountant. He did become the Borough Accountant; but afterwards the Council would not agree to the appointment unless Mr. Gibson was appointed as Joint Accountant with him. The following January this arrangement was carried ont. At that time, Mr. Gibson was a clerk in Mr. Lowden's office. Ultimately a partnership was formed between Mr. Mark Lowden and Mr. Gibson, and they acted as rent collectors, estate agents, and Borough Accountants. As far as the speaker had been able to ascertain from a superficial examination of the accounts, the money of the Corporation began to disappear when the partnership between Mr. Mark Lowden and Mr. Gibson was first formed; and this went on year after year until 1910, when the partnership was dissolved. During that time, they paid £300 per annum to Mr. Stewart Lowden for the goodwill or purchase price of the business they took over. It was not likely that the deed of partnership would say that this payment was in respect of Mr. Stewart Lowden having used his influence. It was understood, however, that £300 was paid each year by the partnership to Mr. Stewart Lowden for five years. It was alleged, by those who claimed to know, that it was in consequence of this payment of £300 a year for five years from the business, which could not afford it, that the money owing to the Corporation had not been properly accounted for. In 1909, Mr. Gibson became Borough Accountant. It was from the date of this change that the difficulties and wrong-doings of the late Borough Accountant began to make themselves felt. In September, 1911, it was decided that, in cases of

accounts for gas being outstanding for three months, the Accountant should be given authority to take proceedings for recovery. So far as he knew, there had been wilful failure to act upon this. It was asked at a meeting of the Council in October of that year whether there had been any outstanding accounts for gas during the preceding two years. The Borough Accountant stated that he thought there was only one case; and he was understood to add that this was the only one in the two years. As a matter of fact, the number of outstanding accounts ran into scores. Another question to which Mr. Lucas's attention should be called was as to whether any members had been undertaking work or contracts for the Corporation out of which they had derived profit. He also invited Mr. Lucas to investigate the following matters: Whether any officials of the Corporation had issued summonses against defaulters for non-payment of their rates; whether such officials were greater defaulters themselves; and whether certain magistrates had granted summonses against defaulters when they (the magistrates) were defaulters themselves. In 1910, he continued, defalcations occured in connection with the gas-works accounts. Slot-meter moneys were misappropriated, and the cash was dealt with in a terribly slack manner.

The first witness was Mr. H. W. Blackburn, who gave evidence as to reports his firm had supplied to the Council. In 1908, he said, attention was called to the fact that in the gas accounts the cash in hand was very large. Defalcations were discovered in the following year, arising out of which a clerk in the employ of the Corporation was prosecuted and convicted. He understood a check was now kept upon the gas collection. Mr. M'Gowan, a local printer, said his name had been published in a list of defaulters; but he denied ever having owed the Corporation a single penny for gas or rates after receiving a demand for payment. He added that the town did not believe either Mr. Gibson or Mr. Lowden had appropriated money to their own use. Mr. Hemingway remarked that the same bad system of collection as had prevailed in the past still existed. He could give dozens of cases in which gas-stove rents were not on the demand notes. Mr. Gill (the new Borough Accountant) admitted that things were in a state of chaos, but were being cleared up as quickly as possible. People had been using gas-stoves free of charge for years. A large amount of further evidence as to the accounts generally was then given.

TRURO GAS COMPANY AND ELECTRICITY SUPPLY.

The Company's Contest with the Corporation.

In the brief report of the annual meeting of the Truro Gas Company which appeared in the "JOURNAL" last week, it was mentioned that reference was made by the Chairman (Mr. John James) to the contest which took place early in the year between the Company and the Corporation for the right to supply the city with electricity for light and power purposes. This portion of the proceedings calls for fuller notice than we were able to give in the preceding issue.

The CHAIRMAN said he anticipated the shareholders would desire him to make some observations on the present position of the electric lighting controversy. The Company's application to the Board of Trade for electric lighting powers was opposed by the Truro Corporation with some measure of success; and the Provisional Order had been granted to them, but with the insertion of the "Winchester" clause. In all frankness, he could say he was not disappointed. While the Directors were perfectly sincere in their desire to see a public electricity supply in Truro, and in their conviction that this supply could be more cheaply and efficiently given by the Company than by the Corporation, they did not regret that the obligation to provide it had been placed in other hands, seeing that the Company's interests, in common with those of other ratepayers, particularly those who could never expect to avail themselves of the light, were, in some measure, safeguarded. He was convinced from a careful study of the financial aspect of the question—a conviction confirmed by what transpired at the Board of Trade inquiry—that a public electricity supply could not be given in Truro with any financial profit. He did not, however, desire to revive an old controversy; but it was only fair that the shareholders of the Company and the ratepayers should know that at a conference with the City Council the Directors made a definite offer that, if the Corporation would allow the Company's application for a Provisional Order to proceed, the Company would give them an option to purchase their Order at cost price, together with their scheduled site, on the condition that, in the event of their purchasing the Order, they would agree to the insertion of the Winchester clause. This offer was declined; and, as a consequence, the Corporation had a less comprehensive Order containing the clause. They were without a site; and when they had selected one, the necessary notices would have to be served, and a further application made to the Board of Trade. The whole of the expenses of this would have to be added to the already heavy bill of costs, which might well have been avoided. And yet, in the face of this, the Company had been charged with having unnecessarily run the Council into these costs. Those who knew the facts thought otherwise. Personally, however, he would welcome the introduction of the electric light in Truro. If they might judge by the experience of other towns in Cornwall, the advent of the electric light had brought nothing but good to gas companies. It had created a healthy rivalry among the consumers, of which the gas companies, as a rule, were not slow to avail themselves; and with their equipment and organization, the shareholders of the Company might feel assured that the Directors were fully prepared to meet any competition.

Mr. J. THOMAS asked what caused the Directors to seek a Provisional Order for electric lighting.

The CHAIRMAN replied that the provision of electric light in Truro had been long discussed. The Company gave the Corporation every opportunity of undertaking it; but they delayed. The public kept on inquiring for electric light; and though the Company were not too willing to incur such an outlay, they had at length to make some move. Had they not done so, he did not know whether, up to the present, anyone else would have moved.

Mr. THOMAS said the Chairman's explanation hardly contained a reply to his question. He was very pleased they had succeeded in securing the Winchester clause; but in regard to the offer made to the Council, he thought a condition was attached to it which had not been referred to. This condition stipulated that if the Company sold their Order to the Corporation, the latter should carry out their scheme within a given time. The Corporation did not wish to be bound-down to that. A very great objection had been the double monopoly the Company would have had if they had secured the Order. Personally, he was sorry the Company moved in the matter.

The CHAIRMAN replied that the matter was discussed at the previous annual meeting and approved by the shareholders.

Mr. THOMAS: It was not decided at that meeting to go forward and supply.

Mr. S. J. INGRAM (the Company's Engineer and Manager) said the matter was distinctly referred to in the Directors' report of last year; and their Parliamentary Agents advised that it was not necessary for a vote of the shareholders to be taken. The whole matter was fully discussed; and approval of the report implied approval of the action of the Directors. As far as he could recollect, there was not a single protesting voice at the last annual meeting. The condition attaching to the sale of the Order to the Corporation, referred to by Mr. Thomas, was one the Company were compelled to impose from the very nature of the Order. An Order was granted conditionally on it being carried out within two years; so that unless the Company imposed some limit as to the time in which the Corporation should exercise their option, the Company would immediately lose the Order. The Company stipulated that the Corporation should exercise their option within twelve months, and so left themselves this period to carry out the Order. It would have been folly to extend the time much beyond twelve months.

Mr. THOMAS thought it would have been more courteous if a definite vote of the shareholders had been taken; and some little complication might have been saved.

The CHAIRMAN: We took the whole of the report as being assented to by the whole of the shareholders present. The Mayor practically told me their minds were made up before we opened the discussion. We have done the utmost we could in the interests of the town; and I do not think the Corporation have an atom of reason to blame us for what we have done.

NEWRY GAS UNDERTAKING.

Refusal of a Loan for Repairs at the Works.

The Local Government Board for Ireland have intimated to the Newry Urban District Council that they could not recommend a public loan of £700 for repairs at the gas-works; evidence given at a recent inquiry by their Chief Engineering Inspector (Mr. P. C. Cowan) showing that there was considerable mismanagement at the works, with serious loss to the ratepayers. [A report of the inquiry appeared in the "JOURNAL" for June 17, p. 832.] The Board, at the same time, stated that the Council, under the advice of their Consulting Engineer (Mr. Isaac Carr, M.Inst C.E.) should make a complete change in the management of the works.

At the last meeting of the Council, the Clerk said that he had not the usual monthly report from the Gas Committee, that body having decided upon delay, owing to the new Manager (Mr. P. B. Ellacott) not taking up his duties until the middle of August. The Chairman (Mr. H. J. M'Conville, J.P.) said the Committee considered the reports that had been sent in unreliable; there being no proper measurement of coal. They now wanted to have the coals measured. Mr. Ruddy, referring to the Auditors' report on the gas-works, said there had been a loss of £700 on the year's working; and he added that the Chairman's estimate of loss quite recently was £1000. The Chairman pointed out that the loss was £775, together with a profit of more than £200; and the Clerk said this was how matters stood.

PRICE OF GAS AT WARRINGTON.

Proposed Reduced Charges to Ordinary and Prepayment Consumers.

At the Meeting of the Warrington Town Council last Tuesday, a long debate took place on the proposal of the Gas Committee—"That the price of gas to consumers (other than those supplied by means of prepayment meters) be reduced by 1d. per 1000 cubic feet as and from the 31st of October next; and that the consumers within the borough supplied by means of prepayment meters be allowed such additional number of cubic feet as will be an equivalent to the reduction in price to ordinary consumers." The Committee expressed the opinion that it was undesirable, if not impracticable, to allow discounts to the consumers of gas using slot-meters.

Mr. OSBORNE moved, as an amendment, that the minute be referred back to the Committee; his argument being that, in view of the enormous profits made, a larger reduction than 1d. per 1000 cubic feet should be granted. If, he said, the Committee had proposed to take 3d. off the price of gas, it would have been repaying the consumers for what might, after all, be considered an overcharge. Since the gas undertaking was acquired in 1877, the Committee had applied no less than £136,473 to the relief of the rates. The total loans taken up amounted to £252,743, of which £107,407 had already been liquidated. From March 31, 1906, to March 31, 1913, inclusive, the profits, after making the necessary deductions for sinking fund, interest, &c., were £111,008; and out of this £104,937 had been allocated to the relief of the rates, or an average for the eight years of £13,117 per annum.

Mr. BROADHURST seconded the amendment.

Alderman TINNION (Chairman of the Gas Committee) reminded the Council that the profits of the undertaking were not wholly made by the sale of gas, but by the sale of the residual products. If they persisted in the policy which some members were laying down, the rates would be increased by at least 1s. in the pound next year. A reduction

of 3d. per 1000 cubic feet would mean £5000; and the cost of production in the Gas Department was advancing, while the profit from the sale of residuals was falling off.

The amendment was carried by a large majority.

Mr. GOUGH submitted the following resolutions, which he was unable to bring forward at the previous meeting: "That all slot-meter gas consumers be allowed 5d. per 1000 cubic feet on all gas consumed on and after Sept. 30, 1913. That all slot-meter gas consumers pay a rent of 1s. 6d. for each three-light meter, and for each five-light meter 3s. per annum. The discount allowed by the Corporation to the consumer shall be returned each quarter or each time the slot-meter is emptied of money. The meter-rent shall be paid each quarter, or a quarter's rent kept out of the discount allowed by the Corporation by the collector each quarter, or each time the meter is emptied."

The resolutions were carried by ten votes to nine.

Alderman TINNION characterized the action of the Council in this matter as foolish. He argued that the users of slot-meters were not being unfairly dealt with, in view of the extra cost involved in supplying the gas to them; nor were they being called upon to pay a higher proportion of profit per 1000 cubic feet than the ordinary consumers.

JOINT-STOCK COMPANIES' RETURN.

The Twenty-Second Annual Report by the Board of Trade on matters within the Companies (Consolidation) Act, 1908, contains a list of the Companies which were dissolved or struck off the register during the year ended Dec. 31, 1912, and this includes the following names, a few of which have since been re-incorporated, under the same or somewhat similar names.

Aberlady Gaslight Company, Air-Gas, Limited, Aldridge Gas Company, Arc Lamps, Limited, Atmospheric Gas Company, Barton-under-Needwood Gas Company, Block Light, Limited, Bruce Peebles and Co., Bristol Acetylene Engineering Company, British Illuminating Company, Clama Gas Compressor, Limited, Cook Gas Engineering Company, Electric Water-Heaters, Limited, French Electric Lighting Boards, Limited, General Incandescent Company, Gosberton Gas Company, Gravity Flame Arc Lamps, Limited, H.C.L. Gas-Stove, Limited, Hall Lamp Company, Harris Cooking and Heating Company, Hercules Incandescent Mantle Company, Improved Electric Glow Lamp Company, Incandescent Manchon Gaulois, Liphook Gas Company, Liss Gas Company, Liverpool Gas-Fittings Company, National Gas-Engine Company, Pirmasens Water Company, Plaissetty Manufacturing Company, Praed Patent Safety Gaslight Company, Scott-Snell Self-Intensifying Gas-Lamp Company, Star Inverted Incandescent Burner Company, Sun Gas Company, Titchfield Gas Consumers' Company, Twin-Light Burners, Limited, U.C. Mantle Company, Universal Gas Methane and "Buisson Hella" Company, Victor Gas Machine Company, Water and Gas Securities, Wickham Market Gas Company, Winchester Electric Light and Power Company.

COAL BYE-PRODUCTS SCHEME FOR SOUTH AFRICA.

A New Source of Sulphate of Ammonia.

According to an article which appeared in the "Financial News" last Tuesday, coal can be mined so cheaply in South Africa that it can be sold at a profit at rather more than 4s. a ton. The market, however, is not large; and the writer of the article says it is becoming apparent to many concerned that the bye-products of the coal would prove of greater commercial value than the mineral itself. A large coal property has recently been acquired in Natal by a company who aim at making South Africa an exporter of sulphate of ammonia. This will command a ready sale in Java and Japan, which, during last year, purchased no less than 120,000 tons of this fertilizer from England. It is calculated that the cost of working the coal will not exceed 1s. 9d. per ton; and a Mond plant is to be laid down which will be capable of dealing with 150,000 tons of coal per annum for the recovery of the bye-products. The producer plant will be in duplicate; each portion being capable of treating 205 tons of coal per day. A sulphuric acid manufacturing plant will be laid down adjacent to the producers.

Gas Danger at the Dublin Disaster.—In connection with the collapse of two tenement houses in Church Street, Dublin, of which accounts appeared in the papers last week, involving the loss of seven lives and injury to many people, fears were entertained for a time that an explosion would result from escaping gas. Mr. W. F. Cotton, jun., the Engineer of the Alliance and Dublin Gas Company, on being informed of the terrible occurrence, at once took steps to cut off the gas. It was found that the main in the street had been broken by the fall of the houses, and men were soon at work stopping both ends.

Falmouth Gas Company.—The annual meeting of this Company was held on Monday last week—Major John Mead, J.P. (the Chairman) presiding. The Directors stated in their report that the sale of gas in the year ended June 30 had increased by upwards of 2 million cubic feet. A new gasholder and coal-store had been erected, which would greatly facilitate the work of manufacture. An interim dividend of 5 per cent., less income-tax, had been paid; and the Directors now recommended a further dividend of 6½ per cent., less income-tax, for the six months ended June 30—placing ½ per cent. each to the insurance and renewals funds, and carrying forward a balance. The Chairman, in moving the adoption of the report, said the year had been an anxious one for gas manufacturers, owing to the extraordinary rise in the price of coals. It had cost the Company £800 more than it had ever done before; but the difference had been made up by the extra profit on residuals. During the past year they had spent between £5000 and £6000 on a new gasholder, &c., which would enable them to realize a larger profit in the future. The report was adopted.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The North British Association meeting commenced informally with a golf match, which has now become an annual institution, on the Wednesday afternoon, over the Greenock Club's course. Mr. Alexander Mackenzie, of Kirkintilloch, won the scratch prize, Mr. Henry Rule, of Kelty, the first handicap prize, Mr. George Hands, of London, the second, and Mr. E. King, of Elland, the third. The arrangements were in the capable hands of Mr. J. O. Scott, of Edinburgh, and a very enjoyable afternoon was spent on the course.

The meeting proper was well attended in point of numbers, but one missed many familiar figures—Mr. Alex. Wilson, who was attending his son's wedding, Mr. Thomas Wilson, of Coatbridge, Mr. W. Wilson, of Falkirk, Mr. Yuill, of Dundee, Mr. Napier Myers, of Saltcoats, and many others. It was perhaps rather a pity that all the papers treated upon nearly the same subject, and for a time it seemed as if there was to be no discussion at all; but, as will be seen from the detailed report elsewhere, many of those present found something to approve of or to object to in the opinions expressed by the readers of the papers. The fixing of Perth for the next meeting-place will be popular with those to whom time and distance are no object and beautiful scenery is a desideratum. But to those who cannot leave their works for a lengthened period, Perth is not very accessible. Certainly the members will be freed from the smoke and dust which were so much in evidence this year when looking eastward from the golf course. No doubt, the comparison was hardly fair, as one saw the hills and the lochs on the north side of the river, with their beautifully clear air and freshness, and on the south side the smoke and soot of the many chimneys in Greenock and Port-Glasgow.

In a North Country paper appears an amusing letter calling attention to a badly-lighted corner, and warning the "City Fathers" that the writer will claim from them if he or his fall owing to the place not being properly lighted, and sue for damages also against the owner for the state of the pavement. If all places not properly lighted were to receive the attention of "City Fathers" about the country which is desired by this correspondent, the managers of gas-works and the suppliers of apparatus would indeed be busy.

The ratepayers of Kirkcaldy are again exercised about the question of the extension of the gas-works, upon which, it will be remembered, it was proposed to spend £45,000. The proposal was delayed and a plebiscite passed by a majority of the Town Council some six months ago; but no plebiscite has been taken, and now a motion has been tabled to drop it altogether. The idea seems to be that money must be spent at once—at least £6000 or £7000—to replace the old retorts, so as to keep on working. Another difficulty is that a proposed light railway along the Sands Road, to be worked only at night, would spoil the amenity of the neighbourhood. Anyone knowing the condition of this part of the town would be surprised that there was any amenity to spoil. But it seems that there is a proposal on foot to utilize some money, which will be available owing to increased assessments, for the purpose of reclaiming the foreshore and building an esplanade. In view of the fact that the municipal elections take place in November, and that the rebuilding of the retorts cannot now be completed for the coming winter, there does not seem to be any great hurry to decide on the policy to be adopted; and it might safely be left until the public have had the opportunity of deciding, by their votes for would-be councillors, if they desire the money to be expended on the present gas-works, or on entirely new works in another position.

The introduction of free cookers in Aberdeen has caused a very large annual increase in the quantity of gas accounted for, and the figures for the last five years are illuminating. In 1909 the increase was 12 million cubic feet, in 1910 16 million, in 1911 24 million. In October of that year free cookers were introduced, and in 1912 the increase became 45 millions, and 84 millions in 1913. These figures speak for themselves, and it should be remembered that this has been done by the expenditure in 1911-12 of about £10,000, and this year of about £5000 on capital account. The estimates for 1913-14 are based upon an increase of 40 millions, making the total output 938 million cubic feet, from which a rental of £106,762 is expected. Coke, tar, &c., are anticipated to bring in about £38,000 more; making a total revenue of £144,892. On the expenditure side, coal is put down at £80,900, carburetted water gas at £5260, wages at £13,000, repairs at £5400; and other small items bring the cost of manufacture to £107,030. Distribution amounts to £10,933, rents, &c., to £8407, sinking fund £11,540, interest £4000, and renewal fund £4000; so that, with other items, the expenditure totals £158,210. The surplus from last year amounts to £14,932; consequently nearly all this will be swallowed up if the estimates are realized, and only £1614 left as a balance to be carried forward for 1914-15.

The question of the municipal supply of gas at Buckhaven has been kept to the fore in the Council meetings; and at the monthly meeting on Monday, it was decided to write to two companies (the Leven and the East Wemyss and Buckhaven Gas Companies) that, unless the offers made to them for so much of their works and plant as was desired by the Town Council were accepted or refused before Oct. 1, the offers would lapse. There is a peculiarity about this supply which is not provided for expressly in the Burghs Gas Supply Act, as both the works are outside the burgh boundary, and the question comes up as to whether the town need buy only the pipes, meters, &c., within their boundary, in accordance with the expression "the property within the Burgh," or whether this property extends to a portion of the works, although situated outside the boundary.

An application has been made to the Stirlingshire County Council by five villages—Denny Loanhead, Longcroft, Haggs, Hollandbush, and Banknock—to be formed into a special district for the purpose of regulating and attending to the public lighting of the streets. This has been acceded to by the Council. An agreement is to be made with the Denny Town Council for the lighting by incandescent gas-burners, and a special rate of 3¾d. in the pound is to be levied. This will no

doubt require the extension of the high-pressure system already in use at the Denny Gas-Works.

The affairs of the Forfar Gas Department came under review at a recent meeting of the Town Council. The estimates showed a total expenditure of £10,751; the coal bill, computed at £5492, being an advance of £674 on the cost last year. The total receipts, with the balance brought forward, were put at £3907; leaving a deficiency of £6844 to be met from the sale of gas. It was calculated that a price of 2s. 8d. per 1000 cubic feet would produce about £6820; showing a probable deficiency of £24. Provost Moffat, who moved the adoption of the estimates in the absence of the Convener of the Gas Committee (Bailie Lamb), said the requirements of the current year had been very carefully considered by the Convener and the Manager (Mr. T. Harper), and they felt they could continue to work at the same prices as last year. These were sanctioned—viz., 2s. 8d. for ordinary and 2s. 5d. for other purposes, and 3s. 1d. to prepayment consumers.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 6.

Sulphate of Ammonia.

The turn of the month has not brought any diminution in the strength of the market, and available supplies, which have not been plentiful, have continued to be readily absorbed at a further increase in values. The closing quotations are £13 8s. 9d. per ton f.o.b. Hull, £13 10s. per ton f.o.b. Liverpool, and £13 11s. 3d. per ton f.o.b. Leith. There have been few transactions reported in the forward position, but it has transpired that £13 15s. per ton f.o.b. at the principal ports has been paid to producers for January-April delivery next year.

Nitrate of Soda.

There is no change in either the tone or the value of this article, and spot quotations are 10s. 9d. per cwt. for ordinary quality, and 11s. for refined.

LONDON, *Sept.* 8.

Tar Products.

The markets for tar products remain fairly steady; but business on the whole has not yet improved. Pitch is still very firm; but there has been no increase in the price. Consumers still decline to pay the present figures either for the prompt or forward position. On the other hand, distillers will not reduce their price. Benzols are very firm, and there is a very great increase in the use of the 90 per cent. quality for motor purposes. Solvent naphtha is quiet with very little new business; and the same remarks apply to the heavy quality. Creosote is firm, and a fair amount of business is reported at very good prices, both for London and country makes. Crude carbolic is again a dead-letter, and Continental consumers appear to have made up their minds not to purchase, even at the present reasonable prices.

The average values during the week were: Tar, 29s. 3d. to 33s. 3d. Pitch, London, 44s. to 45s.; east coast, 44s. 6d. to 45s.; west coast, Manchester, 43s. to 43s. 6d.; Liverpool, 44s. to 44s. 6d.; Clyde, 44s. 6d. to 45s. Benzol, 90 per cent., naked, London, 1s. 1d. to 1s. 1½d.; North, 11½d. to 1s.; 50-90 per cent., naked, London, 1s. to 1s. 0½d.; North, 11d. to 11¼d. Toluol, naked, London, 10⅜d. to 11d.; North, 11½d. to 11⅝d. Crude naphtha, in bulk, London, 5¼d. to 5½d.; North, 5d. to 5¼d. Solvent naphtha, naked, London, 10¼d. to 10⅜d.; North, 9¼d. to 9⅜d. f.o.b. Heavy naphtha, naked, London, 10d. to 10½d. f.o.b.; North, 9d. to 9½d. f.o.b. Creosote, in bulk, London, 3⅜d. to 3½d.; North, 2⅞d. to 3d. Heavy oils, in bulk, London, 3½d. to 3⅝d. Carbolic acid, casks included, 60 per cent., prompt, east coast, 1s. 3d. to 1s. 4d.; west coast, 1s. 2½d. to 1s. 3½d. Naphthalene, £4 10s. to £10; salts, 50s. to 55s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market has remained firm during the past week, and a fair amount of business has been transacted. Many makers report that they have sold a good portion of their make for this year's delivery; but whether this has been sold to actual consumers it is difficult to say. Outside London makes are quoted £12 12s. 6d. to £12 13s. 9d.; Hull, £13 5s.; Leith, £13 7s. 6d. to £13 8s. 9d.; Liverpool, £13 7s. 6d.; Middlesbrough, £13 7s. 6d.

Fire at Great Harwood Gas-Works.—A fire occurred at the Great Harwood (Lancs.) Gas-Works on Friday. It is surmised that matches left in the pockets of labourers had become ignited while drying in the hot-air cupboards, with the result that the building, which adjoins the retort-house, was soon in flames. The local brigade turned out and extinguished the flames, but not before serious damage had been done.

Water Supply for Kenmare.—At a recent meeting of the Kenmare (co. Kerry) Board of Guardians, a letter was read from the agent of the Marquis of Lansdowne's Kerry property stating that his Lordship was willing to contribute £1000 towards providing a proper water supply for the town of Kenmare. On the same occasion, it was announced that subscriptions amounting to £155 per annum had been promised locally for the purpose. An estimate of cost at £5500 was submitted, and the Board decided to provide a supply.

Stockport Corporation Gas Undertaking.—In presenting the Borough Treasurer's abstract of accounts for the past year, Mr. Henry Bell, the Chairman of the Finance Committee of the Stockport Town Council, alluded to one or two of the trading undertakings. The revenue accounts of the gas, water-works, and electricity departments all showed substantial increases. As to the gas accounts, the income advanced £9347; but, unfortunately, the expenditure had gone up at a much greater rate. In consequence of this, it had only been possible to place to the reserve account £1322.

A "MAIN" MEM.

Each Gas Fire Season provides proof of the great popularity of our Fires. The Main Series has earned an enviable reputation in the past, and it is our intention to see that that reputation is enhanced during the coming winter.

Look out for the "Main" Lines.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 13, Whitworth Street West, MANCHESTER; 8, Exchange Place, Donegall Street, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a little fuller shipment of coal from the North; but there is still a lack of ready steamers. This has tended to give further ease to the prices of coal; and it has stiffened the rates for sea carriage. In the steam coal trade, best Northumbrians are from 14s. 9d. to 14s. 10½d. per ton f.o.b.; second-class steams are about 13s. 6d.; and steam smalls are quiet at 8s. to 9s. Some large orders in the market tend to keep the prices from any important fall. In the gas coal trade, the best kinds are steady for prompt delivery, and other qualities are quiet. For best Durhams, the quotation is still about 15s. per ton f.o.b.; second-class gas coals are 14s.; and "Wear specials" are steady at 15s. 3d. For forward delivery, prices show a little ease, more especially for second kinds of gas coals; but there are rather higher rates quoted for sea carriage to many ports. Merchants seem rather more inclined to offer coal at foreign ports at easier values with the delivery over next season; but not so many new contracts are now reported—one lot of about 20,000 tons of best Durham gas coals being stated as sold at 13s. per ton f.o.b., with delivery over next year. Coke is quiet. Gas coke is lower in stock with some producers, owing to larger exports, and is from 17s. to 17s. 3d. per ton f o.b. in the Tyne.

Scotch Coal Trade.

The market throughout Scotland is being well maintained, and prices for all sorts rule firm. On Friday, the Glasgow Coal Exchange prices were as follows: Ell coals, best brands, 13s.; splint, 12s. 9d. to 15s. 6d.; Navigations, 15s. to 16s. 9d.; steams, 11s. 9d. to 13s.; Hartleys, 14s. 9d. to 15s.; trebles, 13s. 3d. to 13s. 9d.; doubles, 12s. 6d. to 12s. 9d.; singles, 11s. to 11s. 3d.; pearls, 10s.; dross, 8s.—f.o.b. Glasgow.

The Incandescent Burner Trade.—According to the "Ironmonger" for last Saturday, "most branches of the lighting trade are busy at the present time, and manufacturers and gas-fitters alike look for a busy season. The demand for incandescent gas-burners is phenomenal. There is a big call for good class burners retailing at 1s. 6d. to 2s.; while the manufacturers of the cheaper grades are simply overwhelmed with orders. Most of the firms who produce burners of the last-mentioned class sold their entire output of the current season some months ago, and are now refusing good business day by day. It is stated that a London merchant recently visited a number of makers in the Midlands with the intention of placing orders with them for 500 gross of burners. But he could find no one willing to undertake the work, and returned to town with the order still in his pocket. One can imagine that it was with much reluctance that the manufacturers are turning such business away; but they say they cannot help themselves. The chief reason is the shortage of young girls in the trade."

Shrewsbury Gas Company.

At the ordinary general meeting of this Company on Monday last week, the accounts presented showed that the profit on the working in the year ended the 30th of June last amounted to £8738. An interim dividend of 2½ per cent. was paid in March; and the payment of a final dividend of 3¼ per cent. was recommended; leaving a balance of £2385 in the profit and loss account. The reserve fund amounted to £12,255, and it was fully invested. There had been an increase of 3¼ million cubic feet in the consumption of gas during the year, notwithstanding the exceptionally mild winter. The number of stoves on hire at the close of the half year was 3903; and there were 4150 prepayment meters in use. The make of gas was 216,550,000 cubic feet, of which 190,788,000 cubic feet were sold by meter and 6,907,000 cubic feet for public lighting. Mr. T. Francis Poole (the Chairman), in moving the adoption of the report and accounts, said the Company had received £417 more for gas, £425 more for coke, £138 more for tar; and their bad debts were less by £35, amounting to only £63 on a collection of £42,640. But these advantages had been practically swallowed up by the voracious appetite of those engaged in the coal industry. The Company had paid £800 more for coal during the past year; but it was satisfactory that while they had carbonized less coal by 0·73 per cent., they had made 1·41 per cent. more and sold 1·68 per cent. more gas. Wages had gone up £200; and the cost to the Company under the National Insurance Act had been £87. The increase of 3¼ million cubic feet in the consumption of gas was satisfactory, especially considering the mild opening months of the present year. In this connection, it might be of interest to the shareholders to know that in 1879, when their worthy Secretary and Manager (Mr. William Belton) took charge of the works, the make of gas was only 83 millions; while in the year just ended it was 216 millions—an increase of 133 millions in 34 years, or nearly 4 millions per annum, and this in a town of moderate dimensions, where there was not the scope for expansion which manufacturing towns offered. In seven years they hoped to celebrate their centenary, and trusted to be able then to announce a progressive and substantial increase. The fact that the first prepayment meters were fixed in 1898, and that the Company now had 4150 in use, and also 3903 stoves fixed on hire, showed how much the public appreciated the convenience, cleanliness, and economy of their use. The report and accounts were adopted.

At the last monthly meeting of the Biddulph Urban District Council, a communication was read from the Local Government Board stating that the Provisional Order authorizing the Council to purchase the Biddulph Gas-Works from the Biddulph Gas Company had been confirmed by Parliament. It was decided to ask the Consulting Engineer (Mr. J. H. Brearley) to attend a special meeting of the Council to arrange the details in connection with the application to the Board for sanction to the borrowing of the money required.

Ilkeston Gas Undertaking.

Agitation, in which the officials of the Gas Workers' Union have played a prominent part, has been particularly fostered of late at Ilkeston in support of the rearrangements of the scale of wages of employees connected with the Corporation gas undertaking, with the result that a new schedule was sanctioned at the meeting of the Council last Tuesday. The Finance Committee were also enabled to report, on the same occasion, that the agreement with Mr. F. C. Humphrys had been settled, with certain alterations by both parties. It is hoped that the last has now been heard of a matter which in the past has led to not a few angry recriminations. Arising out of certain revelations following the disaster to the spiral-guided gasholder and other incidents of local concern, there has been a demand for an alteration in the method of dealing with the municipal accounts. In future, the audit is to be conducted by an official of the Local Government Board; it being problematical whether the Board would, upon any other basis, have acquiesced in certain arrangements.

Stourbridge Gas-Works Extensions.—In the course of a Local Government Board inquiry at Stourbridge (relative to an application by the Urban District Council for sanction to borrow £4500 for the provision of retort-house machinery and plant at the gas-works at Amblecote), Mr. C. H. Webb, the Gas Manager, said that the Committee felt a considerable saving would be effected by the installation of new plant. In the year 1892, 81,879,000 cubic feet of gas were sold, the value being £11,000. Last year, 245,000,000 were sold, which was valued at £29,000. The present prices of gas to ordinary consumers were 2s. 8d. and 2s. 6d. per 1000 cubic feet; and the prices for power were 2s. and 1s. 6d., according to the quantity taken. The carbonizing wages last year totalled £2500; and it was hoped that they would save nearly £1000 in this direction. There was no opposition to the application, which was supported by Mr. S. Fiddian, the Chairman of the Gas Committee.

Distance Gas Lighting.—The following appeared in the "Notes for Gas Users" in the "Ironmonger" last Saturday: "From descriptions of recent patents dealing with electrically-controlled distance gas-lighting systems, it would appear that inventors are favouring the use of permanent magnets. Thus, M. Bucquet, of Louvain (Belgium), has taken out a German patent (No. 248,518) to protect the use of such a valve with the shutting-off member a permanent magnet. The magnetic valve plate is placed between two independent electro-magnets, one pole of which is constituted by the gas-pipe leading to the burner, the other by a casing which is divided into two and surrounds the electro-magnets. The whole arrangement is devised in such a way as to ensure free movement of the valve-plate and certainty of working. The very next German patent, taken out by the Compagnie Anonyme des Allumeurs-Extincteurs du Gaz à Distance, Système Goté, of Bouchain (Nord), France, is designed to secure similar results by the employment of permanent magnets."

Sowerby Bridge and High-Pressure Gas Lighting.—The Sowerby Bridge Gas Committee have appointed a Sub-Committee to visit three towns where high-pressure gas lighting is in operation, and to report. If the views expressed are favourable, and they meet with the approval of the Council, no doubt the system will be installed in the town, so as to be available for shop lighting and other purposes.

Fatal Gas Explosion in a Paris Café.—Owing to an explosion of gas in the cellar of a café in the Rue Legendre, Paris, the ground floor of the establishment collapsed, and many customers were thrown into the cellar. A man was hit on the head by a paving-stone and killed; about a dozen persons were badly burnt, and several passers-by were injured. The explosion is attributed to the carelessness of a smoker, who is believed to have thrown away a lighted match, which set fire to gas emanating from the street, where some workmen were repairing the pavement.

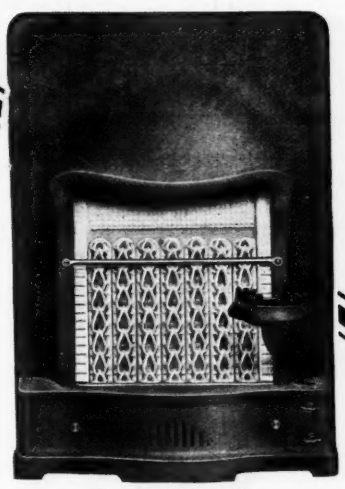
An Unfortunate Experience of Electricity.—The Redditch electrical undertaking, since its installation about fourteen years ago, has, it is stated, entailed a heavy demand upon the general district fund for its support; and this is a burden of which the Council are evidently becoming weary. The pointing out that there is no stand-by plant, led a few days ago to a long discussion, at the conclusion of which notice was given by one member of the Council that at the next meeting he would move that the Clerk be instructed to call a town's meeting to consider the advisability of selling the undertaking.

Wotton-under-Edge Gas Company, Limited.—The first annual general meeting of this Company was held on the 27th ult.—Mr. W. L. Tapscott (the Chairman) presiding. The Directors reported that, as was anticipated, the greater portion of the works had to be reconstructed; and it was found necessary to erect an entirely new retort-house, a governor house, boundary walls and gates, a set of purifiers, a tar-tank, an exhauster and engine, and a two-lift gasholder. A new main had been laid, which would have the effect of improving the supply over the whole of the district. An office and show-rooms had been opened; and the development of the Company's business was proceeding satisfactorily—particularly in regard to the supply of cooking and heating appliances. The revenue account showed a balance of £97, which it was proposed to carry forward. The Chairman, in moving the adoption of the report and accounts, said he was satisfied that the reorganization of the Company and the reconstruction of the works had been a step in the right direction, and that they had now entered upon a prosperous career. Mr. Norton H. Humphrys (the Managing-Director) seconded the motion, and explained in detail the extensions that had been carried out, which, he said, would enable the Company to supply anything up to double the present output without further expense. Referring to the increased business, he said that in July they sent out 25 per cent. more gas than in the corresponding month of last year, and since May they had fixed 37 gas-cookers and had a large number of orders now waiting to be carried out. There was every prospect of a remunerative business in future.

PARKINSON'S
LATEST
PRODUCTIONS.
THE SECOND.

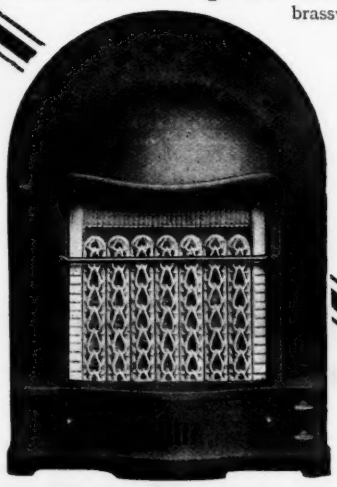
The 'RATCLIFF' and 'EDMUND' FIRES

Gracefully designed on Practical Lines and fitted with a SPECIAL FENDER—a distinctive feature. All the brasswork is encased, thus enhancing the appearance.



THE "EDMUND."

SIDE BOILING BURNER
(as shown on "Edmund" Fire) may be fitted to either fire, and when not required can be instantly removed.



THE "RATCLIFF."

10-in. and 13-in. FIRE OPENINGS.

PRICES FROM 25s.
(Including Tap).

THE PARKINSON STOVE CO., Ltd.,
BIRMINGHAM & LONDON.

Price of Gas in Dublin to be Increased.—The Directors of the Alliance and Dublin Gas Company have given notice of their intention to raise the price of gas to all consumers by 2d. per 1000 cubic feet from the beginning of the December quarter, owing to the heavy increase in the price of coal, oil, and all gas-making materials, as well as in the cost of labour.

Rathfriland (Co. Down) Water Supply.—The Local Government Board for Ireland have sanctioned the application of the Newry No. 1 (co. Down) Rural District Council for a loan of £5900, payment to be spread over a period of forty years, for the purpose of providing a water supply for Rathfriland, and have recommended the Board of Public Works in Ireland to issue the loan.

Cheaper Gas for Trade Purposes at Batley.—At the meeting of the Batley Town Council last Thursday, it was resolved, on a recommendation of the Gas Committee, that the price of gas supplied for trade purposes other than gas-engines should be reduced to 2s. 1d. per 1000 cubic feet to consumers of not less than 25,000 cubic feet per quarter or 50,000 cubic feet per half year, and that the cooker-rents should be abolished—these changes to come into operation from the 1st of October. The object of the Committee in making the recommendation was to increase the consumption of gas.

High Wycombe Gas Company.—At the meeting of this Company, to-day, the Directors will report that the sales in the half year ended the 30th of June showed a steady increase compared with the corresponding period of 1912. The profit was £1296, and the addition of the carry-forward (£2758) and a small amount of bank interest made a total of £4069. There was a sum of £3747 available for distribution; and the Directors recommended the payment of dividends at the rates of 10 and 7 per cent. per annum and of a bonus of 1 per cent on the original and additional shares. After payment of these amounts, there would be a balance of £2612 to be carried forward.

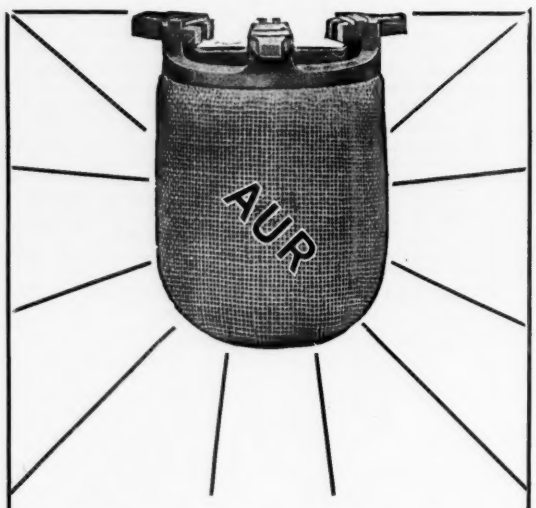
Wakefield Water Supply.—In the course of his annual report, Mr. C. Clemesha Smith, the Water Engineer to the Wakefield Corporation, states that it is remarkable that the meter consumption should have exceeded that of the previous year, in spite of the losses incurred by the strike. The City Analyst's reports showed the anticipated result of filling the reservoirs after the long drought of 1911; the raw water being very peaty and extremely plumbo-solvent. The analyses of the water as delivered to the town clearly indicated the great improvement effected by the lime treatment and filtration. The bacteriological examination showed the water to be practically sterile. Considering the loss of revenue due to the coal strike, the increase of £802 over the preceding year must be regarded as satisfactory.

Teignmouth Gas Undertaking.—At the meeting of the Teignmouth Urban District Council last Tuesday, the Gas Engineer and Manager (Mr. J. A. Gray) presented his annual report. It showed that the gross profit for the year amounted to £1716, and the net profit to £71. The credit balance on the revenue account had been increased to £3510. The average price per ton paid for coal delivered into the store during the last ten years had increased from 15s. 9·4d. to 23s., the new contract for the current year. This encouraged the hope that the price-limit had been reached. The output of gas had doubled during the last ten years. The capital indebtedness of the department on the 31st of March last amounted to £14,632. The Manager was instructed to report on the existing storage for gas and the cost of providing an additional holder.

Holywood (Co. Down) Water Supply.—Mr. David A. Fee has furnished to a body of local ratepayers a report on the water supply of Holywood, in which he estimates that an expenditure of £5000 would be required to meet the exigencies of the situation that has arisen. There is at present, he says, insufficient storage; and a dam might be constructed above the present one, which would contain about 5 million gallons. But the cost would, he thinks, be prohibitive, and would not be a satisfactory solution of the problem. There are no suitable sites for extension on the land now owned by the Urban District Council; and he suggests the erection of a new dam, nearer the Ballykeel catchment, to be capable of containing 15 million gallons. Thirty acres of land would have to be acquired, and the Ballykeel River would act as a conduit connecting the upper settling reservoir with the existing lower dam.

Woking Gas Company.—It was stated at the half-yearly meeting of the Woking District Gas Company that the position of the undertaking was more satisfactory than it had ever been. A net profit on the six months' working of £2009 was reported; and with the balance brought forward, &c., there was a disposable sum of £3196. Dividends were recommended at the rate of 5 per cent. per annum on the preference stock, and at the same rate on the "A" and "B" ordinary stocks—leaving £1371 to be carried forward. The Directors reported that they had obtained a renewal of the contract for street lighting at Woking for a period of seven years. The Chairman (Mr. C. H. Master) paid a warm tribute to the services of the Consulting Engineer (Mr. A. F. Phillips) and the Manager (Mr. W. H. Ely), which, he said, had been one of the great factors in the rejuvenation of the undertaking.

Labour Trouble at the Saltley Gas-Works.—In consequence of a dispute which arose at the Saltley Gas-Works, Birmingham, last Thursday morning, about 50 bricklayers engaged in the erection of the new Koppers coke-ovens threw down their tools, and 35 labourers ceased work in sympathy with them. The cause of the trouble was the arrival of some German bricklayers, who it was supposed were intended to displace English labour. At a conference held in the afternoon, the matter was fully explained to the representative of the Bricklayers' Union. An assurance was given that there was not the slightest intention of substituting German for English labour; and that the foreigners had merely been brought over in consequence of the scarcity of bricklayers and the necessity for the contract to be completed by the date arranged. It was further mentioned that more English labour would be engaged immediately. This explanation was received with satisfaction. Another conference was held in the evening, when it was arranged that the Germans should cease working and leave, and the English bricklayers resume at seven o'clock next morning.



EXPERIENCE

gained from over twenty-five years of mantle manufacture—continual experiments resulting in vast improvements in materials and manufacturing methods.

These are reasons why

Welsbach

GAS MANTLES

predominate to-day — reasons why they combine maximum light with maximum strength and are *always* dependable.

Sample Mantles will be gladly forwarded.

The WELSBACH LIGHT Co., Ltd.,

WELSBACH HOUSE,

KING'S CROSS, LONDON, W.C.,

ALSO AT

DUBLIN, BIRMINGHAM, MANCHESTER, LEEDS, HULL, BRISTOL, AND HANLEY.

The Upright Mantles are C, CX, and PLAISSETTY.

The Welsbach Mantle Factory at Wandsworth, London, S.W.

The Shirebrook and District Gas Company have decided to instal one hundred of the "A. & M." lighting and extinguishing apparatus upon the street-lamps for the ensuing winter.

Commencing from Jan. 1 next, the Directors of the Windsor Royal Gaslight Company propose to make a further reduction of 2d. per 1000 cubic feet in the price of gas—bringing the charge down to 3s.

It was asserted by Alderman Gilbertson, at a meeting of the Southwick Urban District Council, that it cost the ratepayers a halfpenny in the pound per annum to meet the cost of the repairs rendered necessary by boys throwing stones at the lamps.

A company with the title of the Climax Rock Drill and Engineering Works, Limited, has been registered with a capital of £60,000, in £1 shares, to carry on business as gas, electrical, and mechanical engineers, manufacturers of, and dealers in, gas-making, electrical, and other machinery and appliances, &c.

At a recent meeting of the Kilrush Urban District Council, a letter was read from the Board of Public Works in Ireland stating that they were not at present in a position to grant a loan, as applied for, of £600 for repairs at the gas-works and the relaying of mains. It was thereupon decided to form an urban stock to enable the Council to get the money from the Provincial Bank of Ireland.

For the third year, the Smethwick Municipal Technical School are arranging classes in Gas Engineering and Supply; the lecturer being Mr. W. H. Johns, of Saltley (First Honours and Medallist). The session extends from September to May; and the classes are divided into four sections—Gas Engineering (grade 1), Gas Supply (grade 1), Gas Engineering (final), and Gas Supply (final). A systematic course in gas engineering, leading to the diploma of the school, has been organized, in which gas engineering or supply and three additional related subjects may be taken for a composite fee. Information as to terms, &c., may be had from the Principal, Mr. R. W. Hutchinson, M.Sc.

At the half-yearly meeting of the Maidenhead Gas Company (at which Mr. J. W. Walker presided), the report and statement of accounts were adopted, and a dividend at the rate of 6 per cent. per annum on the consolidated stock, less income-tax, was declared.

According to a Central News telegram, a terrific rainstorm broke over New York last Thursday night. In a few moments many of the streets were running streams, and traffic for a time was brought to an absolute standstill. During the storm, there was a partial failure of the electric light, owing to the water invading the plants, and some of the hotels were plunged into darkness.

APPLICATIONS FOR LETTERS PATENT.

19,206.—Keith, J. & G., "Gas lamps, irons, &c." Aug. 25.
19,251.—Kolar, N., "Record, printing, and registering apparatus for meters." Aug. 25.
19,263.—Birnbach, H., "Igniting gas." Aug. 25.
19,363.—Choury, A., "Producing water gas." Aug. 27.
19,383.—Maugras, H., "Generating air gas." Aug. 27.
19,470.—Potter, D., "Gas-heated apparatus." Aug. 28.
19,499.—Bottomley, W., Gleave, W. W., and the United Alkali Company, Ltd., "Manufacture of gas." Aug. 28.
19,507.—Shaw, A. B., "Distant control of valves." Aug. 28.
19,559.—Moeller, J., "Retort furnaces." Aug. 29.
19,570.—Sang, A., "Exhausters, &c." Aug. 29.
19,591.—Lloyd, J. I., "Gas-producing devices." Aug. 29.
19,613.—Lacy-Hulbert and Co., Ltd., and London, A. G., "Air and gas compressors." Aug. 30.
19,637.—Ashmore, W., "Gas and water cocks." Aug. 30.

GAS COMPANIES' STOCK AND SHARE LIST.

The week's record of business on the Stock Exchange is again a monotonous iteration of meagreness—never quieter indeed than last week—to which the closure on Saturday contributed. The general position was fairly satisfactory; it being borne in mind that falls in price were slight—a degree which might easily have been exceeded in markets which were devoid of support. On the opening day, business, such as it was, was quite lacking in feature or interest. Movements were slight and irregular. Consols were practically unchanged; being quoted *ex div.* at figures equivalent to *cum div.* prices. Rails were weaker on labour unpleasantnesses; but there was no fall of magnitude. Americans were almost neglected; the market in New York being shut. Foreign were very fair. Tuesday was quiet; but some markets nevertheless manifested a little animation. Government issues were firm, encouraged by cheaper money; and Rails were dull—the cloud arising from labour troubles being made darker by the Aisgill tragedy. Americans, too, gave way before the close. On Wednesday, business was widely pronounced to have approached, if not attained, a record for quietude. Movements were quite irregular and inconsiderable either way. Government issues and some other gilt-edged securities were rather up; but Consols were contradictorily inclined. Rails were about balanced between rises and falls. The Foreign Market was good. On Thursday, if exact mensuration of minute things were desired, the volume of business would probably prove to be actually less than the day before. The tone generally was weak from sheer inanition. Government issues were all lower, including Consols. The Railway Market was almost deserted, and prices shrank; and Americans were weaker also. On Friday, business approached next-to-nothingness, in view of the closure until Monday; and markets were extremely languid and apathetic. Consols closed at 73⅜ to 73⅝—a fall of 3/16 in the week. Americans were about the best market. In the Money Market, there was an abundant supply, and rates were easy. Business in the Gas Market was extremely moderate (as might be expected); and changes in quotation were few in number and slight in degree. The general tone was quite good. In Gaslight and Coke issues, the ordinary was dealt in at prices within the same limits as the week before—101¼ to 102¼. In the secured issues, the maximum changed hands at 76¼, and the debenture at 73⅜ and 74¼. South Metropolitan was quiet and firm, realizing from 109½ to 110½—a rise of ¼. The debenture was done at 74½. In Commercials, the 4 per cent. made from 105¼ to 106, and the 3½ per cent. 103. Among the Suburban and Provincial group, British realized 45⅜ and 45½, South Suburban 115 and 115½, and (on the local Exchanges) Newcastle marked 100 (a rise of 1), and Tynemouth 112—a fall of ½. In the Continental companies, Imperial was done at 162 to 164, ditto debenture at 84½, Union at 81⅞, ditto preference at 125, European at 18, and Tuscan at 5¼ and 5 5/16. Among the undertakings of the remoter world, Monte Video made 12⅜, Oriental 125½, and Primitiva preference 5 3/32 to 5 3/16.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	April 11	5	Alliance & Dublin Ord.	63—68	..	7 7 1
374,000	,,	July 11	4	Do. 4 p.c. Deb.	80—83	..	4 16 5
280,000	5	April 11	7½	Bombay, Ltd.	6¼—6¾	..	5 11 1
50,000	10	Aug. 28	15	Bourne-mouth Gas and Water { 10 p.c. B 7 p.c. Pref. 6 p.c.	28—29*	..	5 3 5
347,500	10	,,	7		142—154*	..	4 11 10
75,000	10	,,	6		13¼—13⅝*	..	4 7 3
880,000	Stk.	Aug. 14	14	Brentford Consolidated	259—264	..	5 6 1
830,000	,,	,,	11	Do. New	196—201	..	5 9 5
50,000	,,	,,	5	Do. 5 p.c. Pref.	111—113	..	4 8 6
206,250	,,	June 13	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
217,380	Stk.	Aug. 28	11	Brighton & Hove Orig.	201—206*	..	5 6 10
244,200	,,	,,	8	Do. A Ord. Stk.	148—151*	..	5 6 0
630,000	20	Mar. 28	12½	British	45—46	..	5 8 8
120,000	Stk.	June 27	4	Do. 4 p.c. Deb. Stk.	87—89	..	4 9 11
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	89½—91½	..	4 7 5
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	4—5	..	—
100,000	Stk.	June 27	4½	Do. 4½ p.c. Deb. Stk.	75—80	..	5 12 6
157,150	Stk.	Aug. 14	5	Chester 5 p.c. Ord.	107—109	..	4 11 9
1,513,280	Stk.	Aug. 28	5/9/4	Commercial 4 p.c. Stk.	105—107*	..	5 2 1
560,000	,,	,,	5¼	Do. 3½ p.c. do.	102—104*	..	5 2 6
475,000	,,	June 13	3	Do. 3 p.c. Deb. Stk.	71—73	..	4 2 2
800,000	Stk.	,,	4	Continental Union, Ltd.	80—83	..	4 16 5
200,000	,,	,,	7	Do. 7 p.c. Pref.	124—126	..	5 11 1
492,270	Stk.	—	5	Derby Con. Stk.	123—124	..	4 0 8
55,000	,,	—	4	Do. Deb. Stk.	102—104	..	3 16 11
1,002,180	10	July 30	10	European, Ltd.	17½—18½	..	5 8 1
16,386,660	Stk.	Aug. 14	4/17/4	Gas-light and Coke { 4 p.c. Ord. 3½ p.c. max. 4 p.c. Con. Pref. 3 p.c. Con. Deb.	101—103	..	4 14 6
2,600,000	,,	,,	3½		74—77	..	4 10 11
4,062,235	,,	,,	4		93—96	..	4 3 4
4,674,850	,,	June 13	3		73—75	..	4 0 0
258,740	Stk.	Mar. 13	5	Hastings & St. L. 3½ p.c.	89—91	..	5 9 11
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	April 25	11	Hongkong & China, Ltd.	17½—17⅝	..	6 3 11
131,000	Stk.	Mar. 13	7⅝	Ilford A and C	152—155	..	4 18 4
65,780	,,	,,	6¼	Do. B	120—122	..	5 0 5
65,500	,,	June 27	4	Do. 4 p.c. Deb.	89—91	..	4 7 11
4,940,000	Stk.	May 16	9	Imperial Continental	162—167	..	5 7 9
1,235,000	Stk.	Aug. 14	8½	Do. 3½ p.c. Deb. Red.	83—85	..	4 2 4
200,242	Stk.	Aug. 28	6½	Lea Bridge Ord. 5 p.c.	118—121*	..	5 3 4
561,000	Stk.	,,	10	Liverpool United A	204—206*	+1	4 17 1
718,100	,,	,,	7	Do. B	141½—143½*	..	4 17 7
906,083	,,	June 27	4	Do. Deb. Stk.	96—98	..	4 1 8
68,480	Stk.	June 27	3	Maidstone 3 p.c. Deb.	66¼—68½	..	4 7 7

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
75,000	5	June 13	6	Malta & Mediterranean	4⅜—4⅞	..	6 3 1
250,000	100	April 1	4½	Melbourne Met. of { 4½ p.c. Deb.	98—100	..	4 10 0
541,920	20	May 30	4	Monte Video, Ltd.	12¼—12⅜	−¼	6 5 6
1,775,892	Stk.	July 30	4½	Newc'tle&G'tesh'd Con.	99½—100½	+1	4 9 7
629,705	Stk.	June 27	3⅝	Do. 3½ p.c. Deb.	83½—84½	..	4 2 10
55,940	10	Aug. 28	7/10/6	North Middlesex 7 p.c.	12⅝—13½*	..	5 11 5
800,000	Stk.	May 16	8	Oriental, Ltd.	124—129	..	6 4 0
60,000	5	Mar. 28	10	Ottoman, Ltd.	5¼—5⅜	..	5 14 3
60,000	50	Aug. 14	13	Portsea, Island B	122—125	..	5 6 1
100,000	50	,,	12	Do. C	119—122	..	4 18 4
249,980	5	May 16	8	Primitiva Ord.	6—6½	..	6 3 1
499,960	5	June 27	5	,, 5 p.c. Pref.	5—5¼	..	4 15 3
521,600	100	June 2	4	,, 4 p.c. Deb.	93—95	..	4 4 3
346,198	Stk.	June 27	4	River Plate 4 p.c. Deb.	90—92	..	4 7 0
275,000	5	Apl. 11	12	San Paulo, Ltd.	—	..	—
150,000	10	,,	6	Do. 6 p.c. Pref.	11¼—11⅝	..	5 2 2
125,000	50	July 1	5	Do. 5 p.c. Deb.	48—50	..	5 0 0
135,000	Stk.	Mar. 13	10	Sheffield A	225—227	..	4 8 1
209,984	,,	,,	10	Do. B	225—227	..	4 8 1
523,500	,,	,,	10	Do. C	223—225	..	4 8 11
90,000	10	May 30	7½	South African	9½—10½	..	7 2 10
6,429,895	Stk.	Aug. 14	5/9/4	South Met., 4 p.c. Ord.	109—111	+⅛	4 18 6
1,895,445	,,	July 11	3	Do. 3 p.c. Deb.	73—75	..	4 0 0
209,820	Stk.	Aug. 14	8½	South Shields Con. Stk.	157—159	..	5 6 11
952,795	Stk.	,,	6	S'th Suburb'n Ord. 5 p.c.	114—116	..	5 3 5
60,000	,,	,,	5	Do. 5 p.c. Pref.	113—115	..	4 6 11
117,058	,,	June 27	5	Do. 5 p.c. Deb. Stk.	115—117	..	4 5 6
594,740	Stk.	May 16	5	Southampton Ord.	102—105	..	4 15 3
120,000	Stk.	Aug. 14	7⅜	Tottenham and { A 5 p.c. B 3½ p.c.	136—139	..	5 6 1
543,940	,,	,,	5⅛		113—115	..	5 2 2
149,470	,,	June 27	4	Edmonton { 4 p.c. Deb.	90—92	..	4 7 0
182,380	10	,,	5	Tuscan, Ltd.	5—6	..	8 6 8
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	94—96	..	5 4 2
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	111—113	−½	4 8 6
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Aug. 28	8⅜	Wandsworth A 5 p.c.	155—160*	..	5 4 8
255,636	,,	,,	6⅞	,, B 3½ p.c.	129—134*	..	5 2 7
108,075	,,	,,	5/17/3	,, C 3½ p.c.	110—115*	..	5 2 0
352,000	,,	,,	6½	Wimbledon 5 p.c.	107—112*	..	5 8 0
98,000	,,	,,	6g	Epsom 5 p.c.	114—119*	..	5 11 4
88,416	,,	June 27	3	3 p.c. Deb. Stk.	68—70	..	4 5 9

Prices marked * are "Ex-Div."

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

MANAGER AND ENGINEER. Colchester Gas Company. Applications by Sept. 18.

CARBONIZING FOREMAN. No. 5785.

ENGINEER. Metropolitan Gas Company of Melbourne. Applications by Sept. 20.

BOILER AND MACHINERY ATTENDANT. Ramsbottom Gas-Works.

Appointments, &c., Wanted.

CORRESPONDENCE CLERK. No. 5786.

STOKERS. Address, Bridgwater Gaslight Company.

Plant, &c. (Second-Hand), for Sale.

GAS-METERS. Mason, Gateshead-on-Tyne.

HYDRAULIC MAINS, VALVES, MOUTHPIECES, &c. Beaumont and Son, Bromley-by-Bow.

WET METERS. Greenock Gas-Works.

Patent Licences, &c.

"GAS PRODUCERS." Haseltine, Lake, and Co., 28, Southampton Buildings, E.C.

"MANUFACTURE OF COKE AND PRODUCTION OF GAS." Marks and Clerk, 57 & 58, Lincoln's Inn Fields, W.C.

Meeting.

BRITISH GASLIGHT COMPANY. London Offices. Sept. 24. Twelve o'clock.

TENDERS FOR

Coal.

BARRY GAS DEPARTMENT. Tenders by Sept. 24.

Coke.

COMMERCIAL GAS COMPANY. Tenders by Sept. 16.

Constructional Work, &c.

CLECKHEATON URBAN DISTRICT COUNCIL. Tenders by Sept. 16.

Exhauster.

SEDGLEY GAS DEPARTMENT. Tenders by Sept. 13.

Steel and Ironwork.

SHEFFIELD UNITED GAS COMPANY. Tenders by Oct. 6.

Tar.

BLACKPOOL GAS DEPARTMENT. Tenders by Sept. 23.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s 6d.; Quarter, 6s. 6d.
Payable in advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING FLEET, LONDON." Telephone: 6857 Holborn.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 171, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, July 29, p. 336.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, FEN. LONDON."
Telephone: 1588 AVENUE (3 lines).

EDWARD COCKEY & SONS, LTD.,
Supply
COMPLETE CARBONIZING PLANTS,
WASHER SCRUBBERS,
PURIFIERS,
SPIRAL OR STANDARD GUIDED GASHOLDERS.
Prices and Designs on Application to
THE IRONWORKS, FROME, or
LONDON OFFICE: 39, VICTORIA ST., WESTMINSTER, S.W.

FOR SALE.

LEAK TEST,
The Best on the Market
(a) for High Pressure Main
(b) for High Pressure Service.
Full particulars from
JAMES MILNE AND SON, LIMITED,
EDINBURGH, LONDON, GLASGOW, LEEDS.

HUTCHINSON BROTHERS, Ltd.,
FALCON WORKS, BARNSLEY,
MANUFACTURERS OF
GAS METERS (ordinary and prepayment).
MAIN COCKS, &c.
"FALCON" INVERTED LAMPS, for street lighting.
"ZENITH" INVERTED LAMPS, for outside shop, &c., lighting.
"FALCON" INVERTED BURNER LANTERNS.
SQUARE STREET LANTERNS.
BURNERS and CONVERSION SETS for street lanterns, &c., &c.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, London, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
NYMEGEN, HOLLAND.
GENERAL MANAGERS—
London and South of England:
W. T. P. CUNNINGHAM,
13, Arcadian Gardens, Wood Green, LONDON, N.
North of England, Midlands, and Wales:
J. BROWN & CO., LTD., Savile Town, DEWSBURY.
Scotland and Ireland:
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

POULTONS & TIMMIS, Ltd.

CARBONIZING and Boiler Setting Engineers, Complete Installations undertaken.
Their Retort Settings are THE best.
GUARANTEED RESULTS.
Registered Office: READING. Telephone: 265 Reading.
London Office: 53, VICTORIA STREET, S.W.
Telephone: 3512 VICTORIA.
Manchester Office: 55, CROSS STREET.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS.
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DAYLIGHT LONDON." Telephone: 2336 HOLBORN.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED.
Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY WORKS.
Telegrams: "CHEMICALS, OLDBURY."

TAR Wanted.
FREDK. G. HOLMES AND CO., Tar Distillers, Thames Tar Works, NORTHFLEET.

PATENTS AND TRADE MARKS
PUBLICATIONS: "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

OXIDE OF IRON.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
"KLEENOFF," THE COOKER CLEANER.
BALE & CHURCH, LTD.
5, CROOKED LANE, LONDON, E.C.

TAR WANTED.
THOMAS HORROCKS & SONS, LTD.,
Albert Chemical Works,
GRANT STREET, MILES PLATTING, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

PRESSURE REDUCERS.
ACTION—SIMPLE, AUTOMATIC, FRICTIONLESS.
THE THING for your Hilly Districts.
Write to-day for illustrated Sheet—
JAMES MILNE AND SON, LIMITED,
EDINBURGH, LONDON, GLASGOW, LEEDS.

ENQUIRIES SOLICITED.
FOR Gas-Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS.
C. & W. WALKER, LIMITED,
DONNINGTON, NEWPORT, SALOP.

SULPHURIC ACID — Specially prepared for Sulphate of AMMONIA and BENZOL Recovery Plants. JOHN NICHOLSON & SONS, LTD., Hunslet Chemical Works, LEEDS. Tele.: "NICHOLSON, LEEDS." Telephone: (Two Lines), Nos. 2420 and 2421.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the *best*. Satisfaction Guaranteed.

"GUIDE to Patents, Trade Marks and Designs," Sixth Edition, 1913. Send immediately for free copy, giving full and up-to-date information. Chapters on "How to Patent an Invention;" "Warnings;" "Successful Inventions;" "Value of Foreign Rights;" "How to Exploit;" &c. Inclusive fees for this Country and Abroad. J. S. WITHERS & SPOONER, Chartered Patent Agents, 323, High Holborn, LONDON. Established 29 years.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: "SATURATORS BOLTON." Telephone 0848.